ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

L. W. W. MORROW, *Editor*

ALLEN M. PERRY
Managing Editor

A. E. KNOWLTON
Associate Editor

E. R. SEARLES
News Editor

G. F. WITTIG
Statistical Editor

EARL WHITEHORNE
Contributing Editor

JAMES H. RUDD
Publishing Director

FRANK R. INNES
Western Editor
520 N. Michigan Ave.
Chicago

C. W. LEIHY
Pacific Coast Editor
883 Mission St.
San Francisco

H. S. KNOWLTON
Contributing Editor
1427 Statler Bldg.
Boston

PAUL WOOTON
Washington
Correspondent
National Press Building
Washington

What in the World !

Progress, like adversity, has its uses. It is convenient to dramatize the opening of the Century of Progress Exposition in Chicago with the reception of a beam of starlight from Arcturus, 40 years after the Columbian Exposition of 1893. Upon the inspired notion that light starting 40 years ago, at the time of the previous World's Fair, just reaches the earth as this one is opened it is a great idea. Actually, the realists tell us, Arcturus may be 40 or 43½ light years from this planet, some say 33 or 125 light years, and the light which started in 1893 may have arrived in 1926 or still be on its way. But 50,000,000 or more Americans, enmeshed in the superstitions of certainty, will believe differently for the rest of their lives.

●

All industry has its eyes on Washington and the Wagner bill. The electrical manufacturers talked themselves hoarse on this subject last week. New times bring new conditions, and it will take courage to embark upon these uncharted seas. But the sailing orders are issued.

●

Off to the Century of Progress Exposition and the E.E.I. convention we go. We expect to see, to hear and to learn much that is new and interesting and the June 10 issue will give you our editorial impressions.

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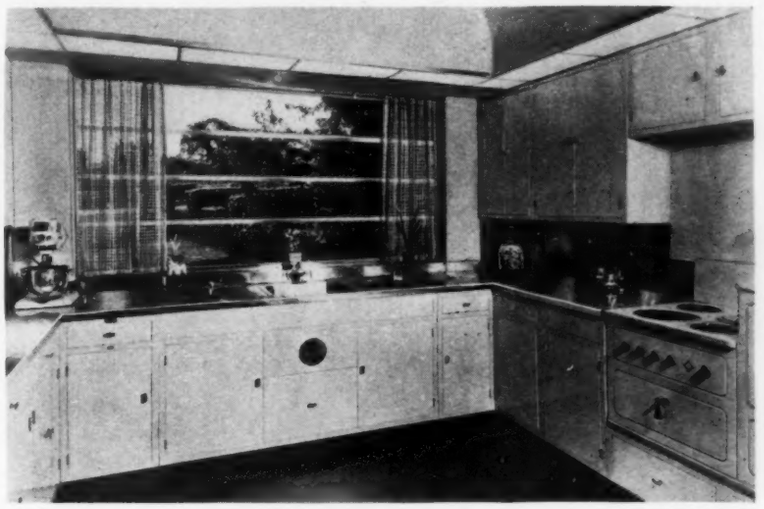
Business is better. Perhaps we can forget our troubles soon. Let us hope, however, that the suggestions of Mr. Stevens and other industrialists will be used and not dropped when balance sheets turn from red to black.



Modern electric kitchen

JUNE 3, 1933

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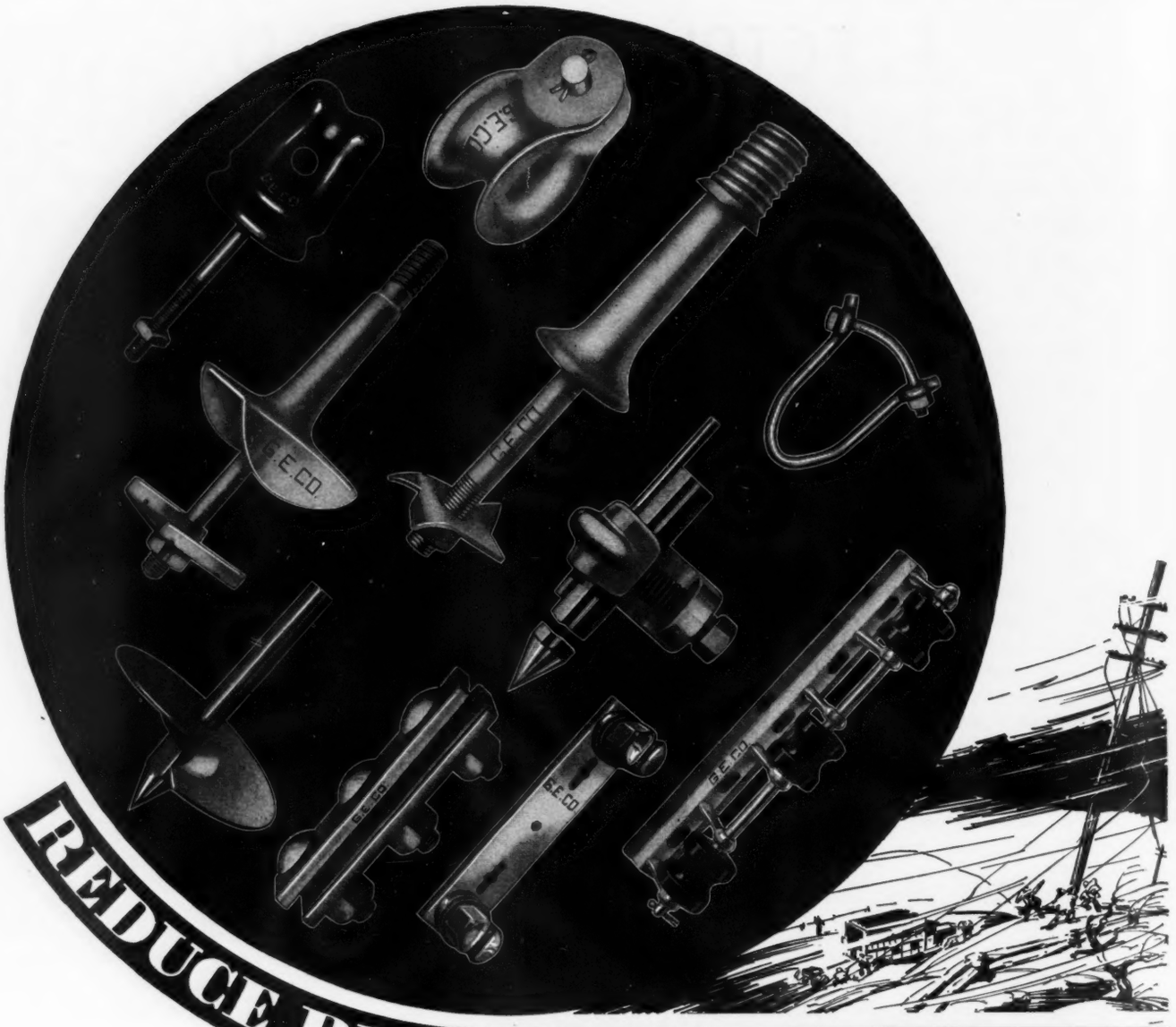

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ELECTRICAL WORLD

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June 3, 1933

United Corporation at Morgan Hearings

COMPLICATED details of organization and financing of the United Corporation, public utility holding company, have been developed at recent hearings before the Senate banking and currency committee which is investigating the banking practices of J. P. Morgan & Company. Testimony given by George H. Howard, president of the company, revealed the fact that Morgan & Company and the Bonbright Electric Corporation had each received 1,000,000 option warrants for $1 a warrant, each warrant entitling the holder to buy a share of common stock of United at any subsequent date at $27.50.

Consulting his records frequently in the course of the hearing, Mr. Howard said the companies in which his corporation holds an interest do 22 per cent of the electric and gas business of the country on an output basis. He stated that when the corporation was formed in 1929 it took over from J. P. Morgan & Company 350,957 shares of common stock, 62,360 shares of second preferred stock and 124,740 option warrants of the Mohawk Hudson Power Corporation, 130,565 shares of common stock of the United Gas Improvement Company, 59,500 shares of common stock of the Public Service Corporation of New Jersey and $700,801.10 in cash. In consideration of the receipt of those shares and that cash, the United Corporation issued 600,000 shares of its $3 cumulative preference stock, 800,000 shares of its common stock and 714,200 option warrants. The securities were turned in at a price about $12,000,000 less than their market value at that time, according to Mr. Howard's testimony.

Morgan control conceded

The original stock plan of the United Corporation, Mr. Howard explained, authorized it to issue 13,000,000 shares, of which 1,000,000 were first preferred, 2,000,000 preference stock and 10,000,000 common.

Upon being interrogated by Senator Couzens as to whether Morgan & Company would have had control only by the exercise of the 714,200 option warrants, Mr. Howard replied: "With respect to the immediate first transaction they had 800,000 shares of common that would give them control. If they had converted they would have got 714,000 more shares of common stock."

It developed at one hearing that General Electric contracted to dispose of its Mohawk Power Corporation holdings to the Morgan firm for what proved to be far below the market price.

▼

Municipal Expansion Law Made Effective in Wisconsin

Legislation to promote the entrance of municipalities into the public utility business became law on May 27 upon signature of Gov. Albert G. Schmedeman. The new law is expected to facilitate financing of municipal utilities by permitting local governments to mortgage anticipated profits in the acquisition or establishment of a utility.

Cost of acquiring a utility was removed from the bonded debt classification, which under the Constitution is limited to 5 per cent of the municipality's assessed valuation. Money for such projects may be secured from the general fund or by issuance of municipal or mortgage bonds or mortgage certificates arranged to mature in annual installments within 40 years. Interest at rates not to exceed 6 per cent annually will be payable semi-annually and amortization of the debt will begin within three years after it was incurred. No part of such debt will constitute an obligation of the municipality.

Each of the financing plans is based on requirement of reasonable service charges to consumers sufficient to pay cost of operation, depreciation and a sufficient return on the capital investment to set up a special fund for consistent repayment of the debt over a period of years.

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Detroit Edison Taxes Double in 10 Years

"We have never made a campaign against high taxes," stated Alex Dow, president of Detroit Edison Company, in an announcement to consumers last week. "We have no wish to make one now, but we may find ourselves in the place where fairness to you will require us to join in such a campaign."

Mr. Dow pointed to specific tax payments over the past thirteen years to prove his point. In 1920 Detroit Edison paid out in taxes 5.1 cents of every dollar received from customers. By 1925 this had risen to 8.0 cents. In 1930 to 10.7 cents. For the twelve months ended March 31 of this year it was 13.5 cents (without including the 3 per cent federal tax paid by consumers). It is pointed out that taxation on the utility is really taxation of the customers since rate reductions are retarded by reduced earnings.

Detroit is beginning to feel the force of trade revival. Energy use has been stepping up at the rate of about 3 per cent a week. For the last week in May it rose 11 per cent over the preceding week.

▼

Conferees Agree on Tax

House and Senate conferees have agreed upon a 3 per cent tax on electric utilities to be levied on the gross revenues received from domestic and commercial customers, effective September 1. Tax to be paid by the utility. Congressional action not yet taken.

Associated Plan Opposed; Protective Committee Formed

Opposition to and counsel against the proposed plan of the Associated system to convert debenture issues under three options (ELECTRICAL WORLD, May 20, page 629) has developed. Recent reports show a protective committee to be in process of organization under the direction of John F. Sinclair. The committee calls the plan unfair and asks holders not to deposit their securities with the company.

E. G. Parsly, president of Parsly Brothers & Company, Inc., states that investment bankers are of the opinion that it is not "the part of wisdom for the debenture holders to assent to the exchange under one of the options," and continues: "We would have no quarrel with the propositions if all other securities now junior to these debentures were also called upon to make some sacrifice, but that is not the case. . . . This seems to be far from equitable."

Martin C. Remer, president of Remer, Mitchell & Reitzell, has written to the bondholders, in part, as follows:

"After a careful study of the plan it seems to us in asking the debenture holders to make certain sacrifices that the management of this company is doing so to protect their own stock interests and maintain their control of the company with no sacrifices to themselves. With the exception of the omission of dividends, we can find no place in their plan where stockholders are encouraged to accept any sacrifices or to deposit their stock holdings for a recapitalization of the company.

Believe receivership better

"J. I. Mange, president, has particularly stressed the dangers to debenture holders which might be incurred through a receivership and forced reorganization," Mr. Remer's letter states, "but it is our frank opinion that the debenture holders of Associated Gas & Electric Company would fare substantially better eventually through a receivership and a consequent reorganization affecting both stockholders and bondholders, than the plan submitted by the company . . . we cannot but feel that while there is a possibility of a default on the Associated Gas & Electric debentures it is not imminent.

"We recommend that you do not, under any condition, deposit any of your debentures at this time with the Associated Gas & Electric Company."

Chase Harris Forbes Corporation, successor to Harris, Forbes & Company, which marketed $203,000,000 of the debentures for Associated between February, 1927, and March, 1930, advised holders under date of May 27 not to deposit their securities with Associated for conversion, since "under the circumstances we do not believe it advisable or necessary. . . . "

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Commonwealth & Southern Report Cites Tennessee

Doubt that the Tennessee Valley Authority will build transmission lines was expressed in the annual report of the Commonwealth & Southern Corporation, signed by B. C. Cobb and W. L. Willkie, chairman and president respectively. The opinion is based upon the cited adequacy and economy of the service and facilities now presented in the territory by existing companies.

The report points to the offer of the Commonwealth & Southern and subsidiaries to buy power and distribute it at rates which will give full recognition to any savings made by the government in the cost of generation.

As part of its policy of corporate simplification, Commonwealth & Southern during 1932 dissolved thirteen companies and changed the capital structures of others. The balance sheet shows $563,123,255 charged to surplus to reduce the book value of investments in subsidiaries.

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Utilities Asked to Extend Service on Credit to Needy

Private utility companies furnishing electric light, water and gas in the State of Washington have been urged by the Department of Public Works, E. K.

When Arcturus Lighted the Chicago World's Fair

Carrying out the dramatically satisfying stunt of initiating the lighting of the Century of Progress Exposition last Saturday with light impulses from the star Arcturus, the whole area leaped into colorful light in the dusk as signals from four observatories were linked. On a huge map in the court of the Hall of Science streaks of neon red indicated the successive pick-up of impulses from many light-years away. With the last signal a powerful searchlight flashed into action and its directed beam then leaped from building to building in the fair grounds, each one bursting into full illumination as the light rested on it.

More than 185,000 visitors thronged through the exposition on its first of 154 days of scheduled life, thereby breaking all records, it is said, for the opening day of previous world's fairs.

Murray, director, to provide free service or service upon credit to all persons whose needs are approved by the county welfare boards. The request, describing the primary object of public utility service as the advancement of general welfare, this objective, when necessary, taking precedence over profits, was sent to all privately operated utilities under its jurisdiction.

Frank McLaughlin, president of the Puget Sound Power & Light Company, has declared his company will "go just as far in the extension of credits as the pressing financial requirements of the company enable us," but pointed out that the organization is paying no dividends on its preferred stock and that its problem at the present time is one of meeting its obligations rather than one of profits. Stating that the company at this time has an excess of generating capacity and a shortage of cash, he said that the company would welcome an opportunity to pay excise taxes in electrical energy and allow the state to distribute the output.

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Smoke Inspection Sustains Blow

Efforts to secure the retention of the broader engineering functions of the smoke inspection division of the Massachusetts Department of Public Utilities through subjecting Chapter 76 of the acts of 1933 to a referendum before its curtailment provisions take effect were set at naught last week by a decision of the Supreme Court of that state. Arguments were heard by the full bench (ELECTRICAL WORLD, May 20, 1933, page 627). The opinion, written by Judge Pierce, declared that the act is restricted to a particular district (29 municipalities in the Boston area) and cannot, by the provisions of the state Constitution, be referred to the electorate for ratification or nullification.

In These Delighted States

Any one who thought that the cruel lessons of 1929 would teach America a few lessons to be recalled in later days should be thoroughly disillusioned by now. In 1929 things grew painfully shaky when stock prices rose to about 25 times current earnings. Today shares are selling for 30 and 40 times current earnings and the speculative mania drives them up further each day. Admitting that the essential basis is the psychological factor of lost currency values and that the wave rises higher due to hopes of improvement in profitable operations, it is difficult to see why funds invested at prices which yield virtually no possible return should be expected to hold prospects of stability. That a tremendous short interest in the market is being built up is the most encouraging news of the moment, but America appears to have learned nothing from experience—its own or other nations'.

Here are a few facts of the week: Car loadings up slightly over the previous week and considerably over 1932; lumber orders now somewhat better than last year; steel production hits a peak with the largest incremental gain of the upturn and is now at the highest since June, 1931; retail trade volumes in May surpassed 1932; automobile output best in more than two years; commodity, stock and bond prices sweep upward; energy production continues its gains.

So on with the Great Illusion. Let the price be repudiation of every accepted principle of integrity and honor. Let solemn covenants and contracts be set aside on the grounds of expediency. Let American enterprise be delivered irrevocably into the political power of economic socialism. How few remember campaign promises. Does this sound familiar? "A sound currency to be preserved at all hazards." Aid-for-industry pleas rapidly fade when business booms again. Now there is union to defeat the industry recovery bill and keep government out of business.

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Radical Rate Plan in New York

SHARPLY swinging from its original objectives, a New York City agitation for lower electrical energy rates has, under the hands of Chairman Maltbie of the New York State Public Service Commission, led to the beginning of a statewide investigation of utility rates temporarily to reduce them to meet new standards of "equities." On a basis frankly conceded to outstep any ever before instituted, it is planned to analyze returns to shareholders since the beginning of the depression, to examine surpluses and thereupon to establish schedules which will force all utility companies to know with sharp pain that an all-enveloping depression is here. Thus we find another state joining the federal administration in scrapping whatever stands in the way of the consummation of alleged social benefits. Good-by Constitution, good-by Declaration of Independence, good-by sanctity of contracts and, perhaps, before long, good-by Supreme Court.

Maltbie states the case

July 1 has been indicated as the date previous to which the temporary cuts affecting New York City are to be instituted. A public hearing for the nine metropolitan companies has been set for June 9.

"There is belief," said Chairman Maltbie, in opening the first hearing last week, "that the utilities have not borne their fair burden of the depression, and that they are not now contributing their fair share toward economic recovery. Unless some practicable means is found for more promptly dealing with rate complaints in this extreme emergency, public regulation will have failed and recourse will be had to some system which will be more responsive to changing economic conditions and to public needs.

"After careful consideration the commission has determined to establish temporary emergency rates wherever the facts relating to a company as set forth in the sworn reports to the commission seem to justify action. It was not contemplated in the establishment of such rates that a valuation of the property as required by the courts for a final determination will be made.

"The commission intends in its investigation to ascertain to what extent the various companies have been affected by the depression, their dividends curtailed and surplus earnings used up. We shall consider to what extent utilities may fairly be required through reduced rates to assist in escaping from the present depression, unequaled in the history of this country."

Carlisle urges caution

"If a radical act is made on the utilities in this state, in my judgment it will defeat the whole theory of regulation, which has been to protect during periods of hysteria, periods of excitement, periods when people, perhaps of the best intentions, lose their heads," said Floyd Carlisle at the meeting. "That is what the law was designed for.

"We didn't share in the advance of rates in the times of great prosperity. Our rates have been on a descending scale, and I can't conceive of anything more harmful to a revival of business than to try to destroy this business. If it is done, it can only be done at the destruction of great investment rights, and the people that work and labor for these companies.

"Now, so far as co-operation is concerned, co-operation, based upon reason, you can have, and will have."

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Federal Securities Bill

Hailing the new "federal blue sky" securities measure already passed by Congress some weeks ago (ELECTRICAL WORLD, May 13, page 597) as a "step in a program to restore some old-fashioned standards of rectitude," President Roosevelt this week signed the bill making it a law. There was an element of grim fatuousness about it all, however, for but a few days before Mr. Roosevelt had asked for a law to negate anything so old-fashioned in finance as the maintenance of the sanctity of contracts, past or future, in government, corporate or private agreements where gold is involved. It all depends, as Æsop perceived clearly centuries ago, upon whose ox is gored.

Coming Meetings

Edison Electric Institute—Chicago, Ill., June 5-8. B. F. Weadock, 420 Lexington Ave., New York.

Canadian Electrical Association — Lucerne-in-Quebec, June 14-16. B. C. Fairchild, Power Building, Montreal, Que.

American Foundrymen's Association — Chicago, Ill., June 19-24. C. E. Hoyt, 222 W. Adams St., Chicago.

American Physical Society—Chicago, Ill., June 19-24. W. L. Severinghaus, Columbia University, New York.

American Society of Agricultural Engineers—Rural electric sessions, Lafayette, Ind., June 22-23. T. E. Hienton, West Lafayette, Ind.

American Institute of Electrical Engineers—Summer convention, Chicago, Ill., June 26-30. H. H. Henline, 33 West 39th St., New York.

American Society of Mechanical Engineers—Chicago, Ill., June 26-30. C. W. Rice, 29 West 39th St., New York.

American Society for Testing Materials—Chicago, Ill., June 26-30. C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Engineers' Day. Century of Progress Exposition—Chicago, Ill., June 28. G. E. Pfisterer, 308 West Washington St., Chicago.

Illuminating Engineering Society—Delavan, Wis August 28-31. D. W. Atwater, 29 West 39th St., New York.

International Association of Electrical Inspectors—Chicago, Ill., September 11-15. V. H. Tousley, 612 No. Michigan Avenue, Chicago.

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Mitchell, Neb., Wins Before Supreme Court

Western Public Service Company, appealing from the decision of the Nebraska Supreme Court in the case of condemnation of utility property for the establishment of a municipal plant at Mitchell (ELECTRICAL WORLD, April 1, page 408), has lost before the United States Supreme Court. The highest tribunal refused to hear the appeal.

Citizens of Mitchell by popular vote favored the proposition of condemnation of the company's property, transmission lines and distribution system. The Supreme Court of the state was requested to appoint three judges of the district court of the state as a condemnation court for appraisal of the property. The company filed objections in that court to the appointment of such a court of condemnation, asserting that the Nebraska act authorizing such appointment contravened the Constitution.

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Close Supervision of Utilities Urged Before Investment Bankers

CLOSE supervision of public utility holding companies by "uniform accounting," a preference for closed mortgage bonds of operating companies and creation of adequate reserves out of earnings for maintenance, depreciation and obsolescence were among the recommendations contained in a report of a special committee of bankers submitted at the annual conference of the National Association of Mutual Savings Banks last week at Swampscott, Mass.

In its report the public utilities committee of the association stated:

We find an increasing disposition on the part of citizens of some communities to own their public utility plants, or, what is more dangerous, to build their own plants to compete with plants already operated by private companies. In some states laws have been recently enacted empowering communities not only to build and operate plants but to extend their operations to adjacent territory, thus putting them on a full competitive basis with existing plants. This brings up the question of the fairness of the rates now being charged by the existing companies, whether their plants and methods are continuously being kept up to date, whether their public relations are good, their management honest, capable and efficient; in short, whether the community is getting such satisfactory service that there is no basis for fair criticism on the part of its citizens.

There is the question of accounting practice. We have become painfully aware of that ogre of obsolescence. We have been assured of the provision for maintenance and depreciation, but we have observed the fate of the railroads, which has resulted in large measure from their failure to make proper provision for obsolescence with the result that it must now be taken care of by elimination of large amounts of stocks and bonds which themselves have become obsolescent. Not only should we strive to have put in force a uniform system of accounting, but that system should have as its objective the utmost conservatism in the valuation of plant, reserves out of earnings for maintenance, depreciation

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Current Earnings Reports of Electric Light and Power Companies

Operating Companies

	1933	1932	Per Cent Increase	Operating Ratio 1933	Operating Ratio 1932
Cleveland Electric Illuminating (Year ended March 31)					
Gross earnings	$23,051,391	$25,405,136	— 9.2	68	65
Net earnings	7,321,166	9,220,925	— 20.6	..	..
Net balance	4,553,592	6,348,083	— 28.2	..	..
Columbus Railway, Power & Light (Year ended March 31)					
Gross earnings	9,364,302	8,828,216	6.1	63	62
Net earnings	3,496,899	3,349,211	4.4	..	..
Net balance	1,356,126	1,661,668	— 18.4	..	..
Detroit Edison (Year ended April 30)					
Gross earnings	41,768,555	47,484,400	— 12.1	72	66
Net earnings	11,810,531	16,019,414	— 26.3	..	..
Net balance	5,455,587	10,033,523	— 45.7	..	..
Duquesne Light (Year ended February 28)					
Gross earnings	24,647,096	27,394,595	— 10.1	44	42
Net earnings	13,853,892	15,960,878	— 13.2	..	..
Net balance*	11,368,905	13,733,986	— 17.2	..	..
Metropolitan Edison (Year ended March 31)					
Gross earnings	10,517,273	11,527,168	— 8.7	63	64
Net earnings	3,854,902	4,169,166	— 7.5	..	..
Net balance	1,758,681	1,867,783	— 5.8	..	..
Milwaukee Electric Railway & Light (Year ended March 31)					
Gross earnings	24,642,727	28,472,521	— 13.4	83	80
Net earnings	4,303,930	5,774,902	— 25.5	..	..
Net balance (deficit)	282,070	1,404,751	—120.0	..	..
Northern States Power (Del.) (Year ended February 28)					
Gross earnings	31,884,990	33,966,373	— 6.1	60	56
Net earnings	12,704,046	14,786,173	— 14.1	..	..
Net balance*	6,829,623	9,011,311	— 24.2	..	..
Union Electric Light & Power (Mo.) (Year ended March 31)					
Gross earnings	27,253,559	30,414,033	— 10.4	54	55
Net earnings	12,383,443	13,596,876	— 8.9	..	..
Net balance	5,266,577	7,944,350	— 33.7	..	..

Holding Companies

	1933	1932	Per Cent Increase	Operating Ratio 1933	Operating Ratio 1932
American Power & Light and subsidiaries (Year ended February 28)					
Gross earnings	$74,606,437	$83,659,385	— 10.8	54	52
Net balance (deficit)	2,114,721	5,437,642	—138.5	..	..
Columbia Gas & Electric and subsidiaries (Year ended March 31)					
Gross earnings	76,853,004	85,615,925	— 10.2	57	59
Net balance	9,959,131	13,999,918	— 28.9	..	..
Electric Power & Light and subsidiaries (Year ended February 28)					
Gross earnings	72,787,494	79,360,114	— 8.3	59	56
Net balance (deficit)	1,145,973	4,524,732	—125.1	..	..
National Power & Light and subsidiaries (Year ended February 28)					
Gross earnings	70,250,935	77,340,682	— 9.2	59	59
Net balance	6,365,450	9,053,012	— 29.6	..	..
Philadelphia Company and subsidiaries (Year ended February 28)					
Gross earnings	47,846,262	55,698,982	— 14.1	66	63
Net balance*	8,309,748	12,940,313	— 35.9	..	..
Public Service Corporation of New Jersey and subsidiaries (Year ended April 30)					
Gross earnings	120,631,218	135,427,986	— 10.9	66	67
Net balance*	26,553,808	30,538,389	— 13.1	..	..

*Available for all dividends.

Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net earnings — Earnings after deduction from gross earnings of operating expenses taken to include taxes, depreciation, maintenance, operating, etc. Net balance — Balance available from income for common stock dividends.

and obsolescence. The allowances made by the government for depreciation in the income taxes have been a deterrent to companies seeking conservatism and an excuse to those which are not.

The statements should give a complete disclosure of the condition of the company. They should contain details of all advances to or from the holding company and of the amounts of dividends paid, particularly where the stocks are owned by holding companies. One of the greatest evils has been the robbing of operating companies by holding companies.

Holding companies—pro and con

C. F. Blanchard, public utility editor of Standard Statistics Company, maintaining that a hierarchy dominates the public utility industry, said that the interest of mutual savings banks in holding company securities might not be direct, because the laws eliminate holding company securities from the issues in which they may invest funds, but he added that they were directly interested in the influence which the holding companies might have upon operating utilities.

However, he pointed to scattered properties gathered into holding companies which obviously served no other purpose than those of furnishing securities to be marketed by security dealers, or which were designed to pour the profits from the increasing business into the pockets of a few individuals.

Primary reasons why operating utility bonds have resisted the depression were enumerated by F. V. Henshaw, of Wood, Struthers & Company of New York, who analyzed the record of 225 issues of 87 companies either approved or tentatively suggested when utility bonds became legal for savings banks in New York in March, 1928. "Company after company," he said, "during a year of bitter distress—with our major industrials commonly incurring large deficits—have earned from two to four times fixed charges, in the electric, gas and telephone industries. While the utilities cannot go quite the way of the railroads, they can be squeezed to death between rate reductions at the bottom and taxation at the top."

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Rates and Competition Missouri Valley Topics

Meeting under a new name, utility executives of Missouri, Kansas, Iowa and Nebraska this year met also with a new type of program. Now known as Missouri Valley Electric Association, formerly Midwest Division of the National Electric Light Association, the annual executive conference eliminated set speeches, as well as imported speakers and any extensive entertainment features.

Principal topics of discussion were: Municipal plant competition, rates, load building, operating economies which have been found effective and various factors in the legislative and tax situation.

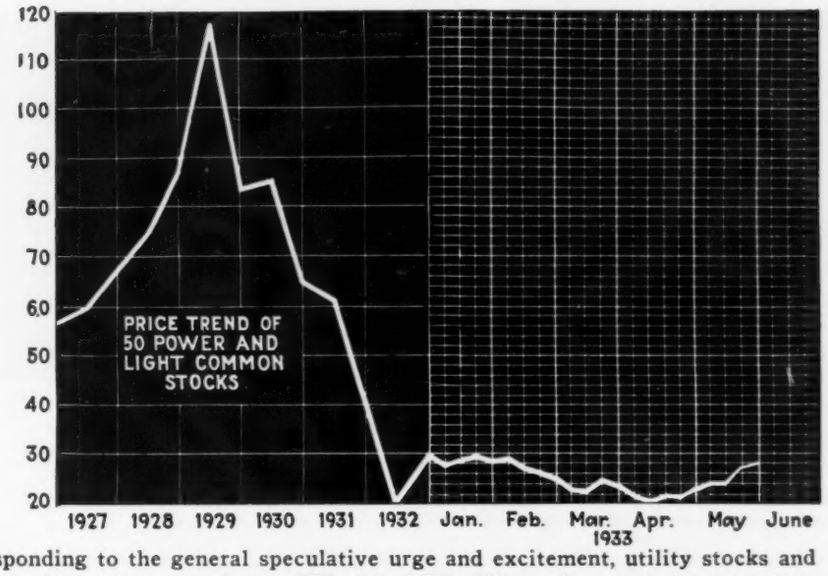
Responsibility in agitation for the erection of municipal plants, for lowered electric energy rates and for the condemnation and taking over of existing plants in Nebraska were attributed largely by L. R. King, president Iowa-Nebraska Light & Power Company, to oil engine salesmen, bond salesmen, engineers out of jobs and "jackleg" engineering firms.

Frank discussion of the alleged abandonment of electric service by 500,000 to 1,000,000 customers led to the revelation that in many cases in the territory charitable organizations were willing to give the needy money for kerosene lighting, but would not do so if electricity were used.

It was the rate situation which took the major place in the discussions, however. Roy Page, vice-president Nebraska Power, pointed to the uncertainties lying ahead in the utility field, inflation, fuel and labor costs, state water power projects and their competitive effects, and emphasized that customers who in 1928-29 were most vociferous in their demands for high continuity of service and standby provisions wish to be relieved of the charges which those refinements require.

New officers selected were: President Roy Page, Nebraska Power; vice-presidents, G. A. Neal, Sioux City Gas & Electric Company; D. E. Ackers, Kansas City Power & Light, and Frank Payne, Union Electric Light & Power.

Utility Securities Reflect Speculation



Responding to the general speculative urge and excitement, utility stocks and bonds show sharp upswings. "Electrical World" stock average rose to 28.3, last week 26.2; bonds stand at 90.2, last month 84.6.

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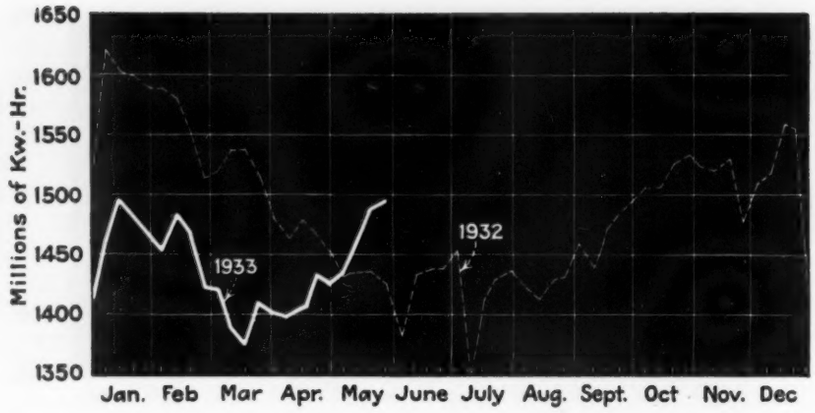
Output Continues Rising



With the production of 1,493,923,000 kw.-hr. in the week ended May 27, central station energy output increased for the fourth consecutive time and widened the advance over last year to 4.8 per cent, according to the Edison Electric Institute. It virtually equaled that of the week of January 14, and overshot all others of 1933 thus far. This condition has been approached in no other year since the weekly survey was begun.

Strong gains were made on the Atlantic Seaboard and in the Central industrial area. New England's lead over 1932 increased to 11.2 per cent. The Pacific Coast alone is still down.

Weekly Output, Millions of Kw.-Hr.

Week ended	1933	1932	1931	1930
May 27.....	1,494	1,425	1,602	1,660
May 20.....	1,483	1,436	1,645	1,723
May 13.....	1,468	1,437	1,654	1,717
May 6.....	1,436	1,429	1,637	1,689
April 29.....	1,428	1,455	1,644	1,698

Per Cent Change from Previous Year

Region	Week Ended May 27	May 20	May 13
Atlantic Seaboard.....	+6.3	+5.0	+4.2
New England alone..	+11.2	+7.1	+7.7
Central industrial.....	+5.4	+3.5	+1.4
Pacific Coast.....	—7.3	—7.2	—7.2
United States.....	+4.8	+3.3	+2.2

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N.E.M.A. Considers Plans; None Has Been Approved

Though the board of governors of the National Electrical Manufacturers' Association was given full authority to do all expedient things that might be specifically permitted or required by Congress in connection with the industry control bill (ELECTRICAL WORLD, May 27, page 658) at the N.E.M.A. meeting in Hot Springs last week, no definite action has so far been taken.

This was emphasized by A. W. Berresford, managing director of N.E.M.A., in a statement this week when he pointed out that not a single provision of the bill as passed by the House of Representatives has been officially indorsed by the association.

"There is," Mr. Berresford asserted, "no commitment to any definite program for the proposed control of industry. What the law specifically requires or permits the association will do and with full appreciation of the major objective —the return of men to work."

Two plans under consideration

Two programs are under consideration by the association at present. One plan, framed by an informal committee, of which Francis E. Neagle of New York, counsel for the association, is chairman, contains no specific provisions, but simply enumerates by title certain rules, regulations and policies of operation, as well as administrative procedure, which might conceivably be necessary after the industrial control measure is placed upon the statute books. The second, or Swope plan, offers more detailed proposals as to working hours and wages, life and disability insurance, pensions, unemployment insurance and unemployment emergency.

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A. E. Peirce Offices Moved

Transfer of the executive offices of the reorganized Albert E. Peirce utility properties from Chicago to New York has been completed, a development which was anticipated when Stone & Webster, Inc., was appointed early this year to manage the properties (ELECTRICAL WORLD, January 21, page 84). The group to be supervised includes the largest proportion of the $357,000,000 of utility properties assembled under the former Central Public Service Corporation, now vested in the Consolidated Electric & Gas Company and the holding company, Central Public Utility Corporation.

Federal Trade Commission Probes U.G.I. Properties

Four public utility companies operating in Connecticut and all included in the United Gas Improvement Company system supplied the material for testimony at the Federal Trade Commission's hearings last week. They were the Connecticut Light & Power Company, Eastern Connecticut Power Company, Rockville-Willimantic Lighting Company and Waterbury Gas Light Company. Edwin T. Harris, accountant for the commission, testified that the common stock of the Connecticut Light & Power Company was entirely owned by the Connecticut Electric Service Company, a subsidiary holding company of U.G.I., which owned 59 per cent of the service company's common stock. Appraisal of the physical properties by Day & Zimmermann, Inc., Mr. Harris said, based on reproduction costs new, was $55,478,387, or $5,222,673 less than recorded costs. Based on reproduction costs less observed depreciation, the appraised value was $51,260,550, or $8,384,893 less than recorded costs. Day & Zimmermann did not make a valuation of certain undeveloped power sites. Had such been done the difference between book values and appraised values would have been lessened.

Intercompany cash loans were made at interest rates on a basis comparable to rates obtainable from banks. Since September, 1929, the general policy adopted is that the holding company shall receive no cash loans from the operating companies. The rate of return in some years appears to have been less than a "fair return."

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Illinois Power & Light Receiver Asked in Chicago

Appointment of a receiver for the Illinois Power & Light Corporation, subsidiary of North American Light & Power Company, has been asked in a bill filed with the United States District Court in Chicago by attorneys for an avowed holder of three of the company's mortgage bonds. It is alleged that the organization has fraudulently issued reports and statements to shareholders, that its 1932 annual report shows a surplus of $2,749,563, whereas it should have shown a deficit of $27,272,541, and that it deducted substantially larger depreciation charges in its federal income tax returns than is shown in the report to stockholders.

Commenting upon the charges, President H. L. Hanley of Illinois Power & Light has stated: "There is absolutely no foundation for the claims made in the bill exhibited to our attorneys and there can be no justification for these proceedings."

Federal Court Backs City in Campbell, Mo., Plant Row

In a decision handed down last week the United States Circuit Court of Appeals reversed the decision of United States District Judge C. B. Faris of St. Louis, who last fall held that city officials of Campbell, Mo., and Fairbanks, Morse & Company were in civil contempt of court because they entered into a contract for the equipping and operation of a municipal light and power plant in Campbell (ELECTRICAL WORLD, November 19, 1932, page 674). While setting aside the contempt of court charge the Court of Appeals held that the Arkansas-Missouri Power Company, which has a franchise to do business in Campbell, might bring an injunction suit against a new contract between the city of Campbell and the manufacturers.

The power company in its suit charged that the city of Campbell had exceeded its constitutional debt limit in 1930 by constructing an $80,000 municipal light and power plant and distribution system. Early in 1931 Judge Faris issued an injunction forbidding the operation of the plant. The city and Fairbanks, Morse & Company then entered into a new contract and the plant continued operations. When Judge Faris ruled last fall that his injunction applied to the new contract and that the defendants were guilty of civil contempt they appealed.

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Nebraska to Seek R.F.C. Aid to Finance Power Projects

Plans are being formulated by various territorial areas in Nebraska for securing loans from the Reconstruction Finance Corporation to finance the construction of combination irrigation and power projects. The Platte Valley Reservoir Association is preparing to qualify for a $5,000,000 loan for a project in central Nebraska on the Platte River and the Middle Loup Public Power and Irrigation District has asked approval of the state Department of Public Works of a million-dollar development in the Middle Loup Valley near Sargent, to irrigate 50,000 acres and sell surplus power from a plant near Comstock.

With the purpose of linking together all of the municipal power plants in 63 of the 93 counties of the state, E. G. Stage, construction engineer of Lincoln, and B. G. Gibbons of Kearney are preparing to incorporate under the name of the Nebraska Public Power and Irrigation District. There will also be included four district developments formed or in process of formation. Application will be made to the Reconstruction Finance Corporation for between $30,000,000 and $35,000,000 to finance the project. Petitions are in circulation, and if 15 per cent of the voters of the state sign the petitions application will be made for approval of the Public Works Department.

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Seek Removal of Maltbie From New York Commission

Seven specific charges have been presented to Governor Lehman of New York as a basis for the requested removal of Milo R. Maltbie, chairman of the State Public Service Commission. The charges, made by the Community Councils of the City of New York, seek to show that Mr. Maltbie in the 1930 rate case of the New York City properties of the Consolidated Gas Company acted in favor of the electric utilities rather than in the public interest. The petition for removal was filed a short time ago.

The charges are: In his decision the commissioner sought to convince consumers that they were obtaining a reduction, whereas many were subjected to increased bills; the policy of conciliatory negotiation opened a course of least resistance for the utilities; when costs of materials and labor were falling rapidly no effort was made to further reduce rates; a request for such action was ignored; "a deliberate tendency to protect the monopolistic electric utility companies of Manhattan from any and all attempts at legitimate competition"; evasion of civil service laws, and employment of consultants who are doing business privately as Maltbie Associates.

At least one influence behind this move is the failure of the Spingler Electric Corporation to secure a certificate of convenience and necessity from the commission after receiving a franchise from the city Board of Estimate.

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State Power and Flood Projects for Minnesota?

Four large water-power and flood-control projects involving $10,000,000 will be requested by the state of Minnesota under the proposed public works program of the federal government. This was announced last week following conferences between Gov. Floyd B. Olson and E. V. Willard, acting commissioner of conservation.

Projects decided upon for request of federal assistance are: Development of water power on streams on the north shore of Lake Superior for manufacturing and for serving municipal and domestic needs, at an estimated cost of $5,000,000, developing from 40,000 to 50,000 hp. Works on the Minnesota river for flood prevention, increasing supplies for domestic and municipal uses, aiding in maintenance of a navigable stage of water on the Mississippi below St. Paul and creating additional water power at St. Paul and below. Estimated cost, $2,750,000. Plans to control the outflow of the upper and lower Red Lakes to make a reservoir of these large bodies of water from which a more uniform flow can be maintained in the Red Lake river for power production, increasing municipal and domestic supplies and for flood control. Estimated costs, $1,000,000.

In excess of $213,000 has been expended by the state on this latter project between 1908 and 1920 in dredging and other improvements which have proved ineffectual because of the difficulties in financing of a comprehensive program to remedy the situation.

Procedure for presenting Minnesota's case to the federal officials as soon as Congress approves of the national program was agreed upon by Governor Olson and Commissioner Willard, but details were not divulged.

Major New Construction This Week

Iowa Electric Light & Power Company, Cedar Rapids, Iowa, plans construction of 33,000-volt transmission line in Cedar County.

Industrial electrical equipment, pumping machinery and transformers will be installed by Hartford (Conn.) Brewery Company in a $600,000 project.

Heavy-duty motors, electric pumps and conveyors will be installed at Whiting, Ind., refinery of Standard Oil Company of Indiana. Cost over $500,000.

Two Rivers, Wis., arranging fund of a250,000 for a city-owned electric light and power plant.

Interboro Beverage Company, Brooklyn, N. Y., plans $400,000 addition.

Newark, N. J., is arranging fund of $3,500,000 for completion of city electric railway project, including power and feeder lines, substation apparatus and other equipment still to be purchased.

Transformers, motors, etc., will be installed by Harvey Coal Company, Harveyton, Ky., for power substation and motor house. Cost about $70,000.

Wurzburger Brewing Company, Inc., Kansas City, Mo., to build a $200,000 plant at North Kansas City.

Motors, controls, electric hoists, panelboards, conveyors and other equipment will be installed in new publishing plant of Providence (R. I.) Journal Company, Providence. Cost over $500,000.

New York Metal Prices

	May 23, 1933 Cents per Pound	May 29, 1933 Cents per Pound
Copper, electrolytic	7.00	7.25
Lead, Am. S. & R. price	3.65	3.90
Antimony	6.25	6.25
Nickel ingot	35.00	35.00
Zinc, spot	4.10	4.35
Tin, Straits	35.625	38.875
Aluminum, 99 per cent	23.30	23.30

Antidote Found for Electric Shock

Experiments at the Johns Hopkins University have shown that an electric shock of high voltage is an antidote for an otherwise fatal shock from low voltage. It has been demonstrated that a "fibrillation" set up in the heart by the low-voltage shock is halted through application of the higher voltage and normal pulsation is permitted to be resumed. A fibrillation, Dr. W. B. Kouwenhoven, who conducted the experiments, explained, is a condition of the heart muscles when co-ordination is stopped and the muscles twitch spasmodically, disrupting circulation of the blood.

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Industry Employment Up in Britain

Improvement in the electrical industry in Great Britain continues. Recent reports indicate that in 1932 the industry employed 201,000 persons, as compared with 191,000 in the preceding year, an increase of 5 per cent. In wiring and contracting, reflecting the growth in domestic use, there was an increase in employment of 11.5 per cent. Cable, apparatus and lamp manufacturers increased their man-requirements by 8.5 per cent.

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Jugoslavia Electrifies

Progress in the electrification of Jugoslavia is increasing rapidly. In 1932 the total output of electricity there totaled 767,800,000 kw.-hr. The 618 generating stations, ranging in capacity from 50 kw. to more than 10,000 kw., have a total output capacity of 446,679 kw. There are 108 hydro projects, 189,257 kw.; 249 steam plants, 172,110 kw.; 64 mixed power plants, 62,912 kw., and 197 internal combustion plants, 22,400 kw. One chemical plant utilizes as much as 130,000,000 kw.-hr. a year.

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All-Metal Radio Tubes

Thermionic tubes suitable for replacement of the familiar glass bulb type but utilizing metal jackets which act as the anode of the tube have been developed in England. Numerous advantages are cited, including increased durability and freedom from breakage, smaller space requirements, better maintenance of vacuum and reduced heating of the anode.

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H. J. Drane to Power Commission

First member of the Federal Power Commission to be selected by President Roosevelt, former Congressman Herbert J. Drane of Florida is slated for inclusion in that body. Appointment must be approved by the legislators before it can be effective. Mr. Drane has been active in local politics for many years. He has been Mayor of Lakeland, state Representative and Senator, and Congressman. He has been engaged in the real estate and insurance business in Florida.

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Cities Service Cleared in Kansas

Fully vindicating the Cities Service Company in its right to sell securities within the state the Kansas Corporation Commission has issued an order supplanting the temporary permit issued last March. In its order the commission states the "company has made the required showing as provided in the law and on these reports, certified by certified accountants, there does not appear any ground under the Kansas law for denying a permit to sell the securities now outstanding."

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Portland Salaries Cut

Reduction in all salaries and wages of the Portland General Electric Company, subsidiary of the Portland Electric Power Company, Portland, Ore., was effected this month. Reductions range from 5 to 17½ per cent. In the case of electrical workers whose wages are fixed by union agreement, this was the first change since April, 1931. The men agreed to accept the cut without arbitration when the company put the situation squarely before them. They also agreed to continue working on a short week so that more men might remain on the payroll.

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International Combustion Reorganizes

Court approval of an offer of $2,000,000 for the property of the International Combustion Engineering Corporation and its subsidiaries, made by the reorganization committee of the company, has been approved by the federal court. Creditors of the parent company and its affiliates are to be invited to supply the $2,000,000, receiving in return an equivalent amount in first mortgage 6 per cent gold bonds and an aggregate of 120,000 shares of common stock of a new company to supplant the old.

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Washing Machine Sales Improve

April in household washing machine factory sales continued the trend shown for the preceding three months. As reported by J. R. Bohnen, secretary of the American Washing Machine Manufacturers' Association, 54,184 units were sold in April, which, incidentally, was the best month since October, 1931. The figures compiled represent 90 per cent of the country's production. Each month this year has shown an increase over the preceding one.

Merchandising Order Suspended

That recent order of the Oregon Public Utilities Commissioner attempting further to segregate utility merchandising and other operations (ELECTRICAL WORLD, April 29, 1933, page 535) has been suspended pending further hearing and order. This suspension follows application for reconsideration of the subject by certain utility companies and the rehearing is set for June 6. The order in question prohibited any employee engaged in the regulated utility business from performing any duties for the merchandising and jobbing department of the utility, "except the principal executive officers of the company."

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Automatic Insect Traps

Refinement of the insect traps used on farms under the jurisdiction of the New York state agricultural experiment station has proceeded to the point where, according to P. J. Parrott, station entomologist, the light traps are only energized as both light and temperature conditions require. Control is effected through photoelectric cells and thermostats, making the action both economical and wholly automatic. The traps used are of the type incorporating electrocuting devices.

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New Orleans Crisis Feared

Receivership of the New Orleans Public Service, Inc., a subsidiary of Electric Power & Light Company, impends unless something can be done to meet the emergency of dropping revenues and rising taxes, A. B. Paterson, president, stated in a communication to the Commission Council, under the control and guarantee of which the company has been operating since its reorganization in 1922. Mr. Paterson said the general mortgage 4½ per cent bonds, which amount to $12,102,700 cannot be met when they mature July 1, 1935, unless the earnings of the company show decided improvement. The dividend on the preferred stock was cut in half in April of this year.

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Utility Loses Injury Verdict

In a decision handed down last week the St. Louis Circuit Court returned a verdict of $5,000 against the Missouri Electric Light & Power Company in favor of one who suffered injuries when lightning struck electric wires entering the summer home of a relative. The power company contended in its defence the accident was an act of Providence, over which it had no control. A similar case resulted in a like decision early this year when the Alabama Supreme Court affirmed a judgment for $9,500 damages against the Alabama Power Company

for the death of a young girl killed by lightning while sitting under an electric lamp in her home (ELECTRICAL WORLD, January 28, page 117).

With the Legislators

DISTRICT OF COLUMBIA—Draft of the bill designed to give the Public Utilities Commission of the District of Columbia broader power in administration of the public utilities act of 1913, which has been under preparation for several weeks (ELECTRICAL WORLD, May 6, page 568), has been sent to Congress.

ILLINOIS—Bill to prohibit any person or company from holding more than 2½ voting shares of a public utility, the outstanding voting stock of which shall have a par value of $10,000 or more, or more than 5 per cent of such shares of any other utility, has been introduced for discussion in the Illinois General Assembly.

INDIANA—Measure imposing a gross income tax of 1 per cent on all electric current sold in the state has passed. This tax will be passed to the consumer. The newly amended chain store tax will affect those electric companies which operate merchandise stores in several cities. Increases start on brackets from six stores up, those companies operating six to ten stores inclusive having been increased from $15 to $20 a store and those having between eleven and twenty inclusive having been raised from $20 to $30 a store. The law was aimed at the large drug and grocery chains, but it will affect some of the electric utilities. An administration measure has passed which amends the public service law to provide that municipalities may lease, construct or purchase public utilities following special elections and pay for them out of the earnings. The bill permits municipalities to set their own rates, which are now fixed by the commission, if the majority of voters approve. It provides that if utilities make extensions costing more than $10,000 without getting approval of the commission, such extension shall not be considered by the commission in determining rates. The bill eliminates going value and other intangibles from rate-making valuation and limits valuation of land in rate-making cases to the assessed valuation for taxes. A new law provides that if a corporation fails to file its annual report with the Secretary of State, he shall certify to the Attorney-General this delinquency, and the Attorney-General shall take steps toward revoking the company's charter without further notice.

MICHIGAN—Only municipally owned street railways and water plants among public utilities are exempted from the general sales tax bill which Governor Comstock has forced through the House and which is expected to raise the total state levies to $45,000,000 a year. The bill calls for a tax of 3/10 of 1 per cent on manufactured products. Where the manufacturer sells direct to the public he must also pay the 3 per cent retail tax, or a total of 3.3 per cent on gross sales.

Manufacturers Report Increased Schedules

Improved industrial conditions continue to be reflected in the steadily increasing sales volume of electrical manufacturing companies.

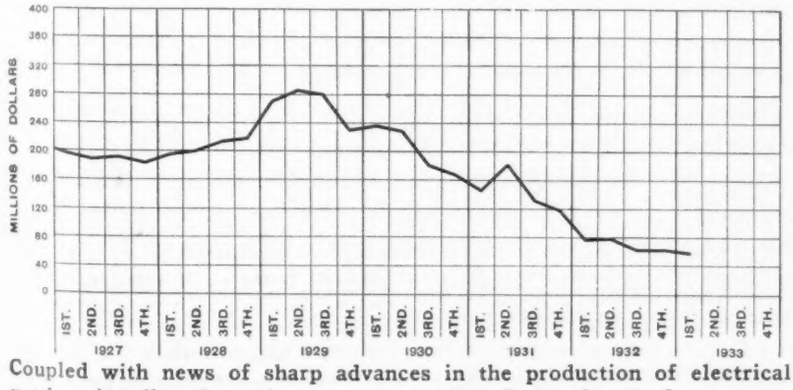
FRIGIDAIRE CORPORATION—Fifteen hundred additional men have been added to the factory payroll to make possible peak production schedules for household electric refrigerators, E. G. Biechler, president, has announced. The company's Dayton force now numbers in excess of 9,000 persons, the largest since 1929.

KELVINATOR CORPORATION—More electric refrigerators were shipped by the company in the first 23 days of May than in any full month in the history of the company, according to a statement by George W. Mason, president. The record for a full month was made in April (ELECTRICAL WORLD, May 27, page 661).

As to Rates——

- Under the provisions of an order issued by the New York Public Service Commission last week the Bronx Gas & Electric Company will have to lower its rates within twenty days or show why the complaints made by the city should not be met. Complaints, signed by Mayor O'Brien, allege electric and gas rates charged by the company to be excessive.
- Pending further investigation, a temporary order making certain reductions in electric rates charged by the Central Illinois Public Service Company has been issued by the Illinois Commerce Commission. Officials of the company, the largest operating subsidiary of the Middle West Utilities Company, estimate that the reduction will amount to approximately $100,000 a year.
- In a resolution introduced by Senator Bradford Crittenden and passed by the Senate last week the California State Railroad Commission is requested to proceed immediately toward the general reduction of public utility rates to a level comparable with other commodities. There was but one dissenting vote.
- To farmers who are facing power cut-off notices because of unpaid bills, the Department of Public Works, Olympia, has instituted a general investigation of irrigation power rates in eastern Washington. The department, proceeding on its own motion, entered formal complaints against the Puget Sound Power & Light Company, Washington Water Power Company and Pacific Power & Light Company, the three companies having been joined in one proceeding. As the first step toward its immediate objective, the department issued an order directing the companies to furnish power service to all farmers requiring it, pending the outcome of the investigation.
- Failing to secure the relief requested of the Mississippi Power & Light Company in the matter of reduced rates, Natchez authorities have adopted an ordinance requiring the utility to make reduction of gas and electric rates of 20 per cent. At a recent conference it was pointed out to representatives of the city by power officials that because of declining revenues no reductions could be granted.

First Quarter Orders Declined Slightly



Coupled with news of sharp advances in the production of electrical goods going directly to the consumer market, figures for the first quarter of 1933 as reported by 78 electrical manufacturers to the Department of Commerce are encouraging.

EDITORIALS

L. W. W. MORROW
Editor

Action for trade associations

THE administration bill for the control of industry is before Congress for action and will be passed. This is the most significant act affecting business ever presented to Congress. There can be no mistaking the fact that we have departed from a policy of unbridled competition enforced by anti-trust laws and embarked upon a policy of governmental control of industry which takes the form of forcing industry to organize into trade associations and even the licensing of individual enterprises by the government. The executive power is in the hands of the government and not in those of industry executives. This new governmental policy is not and cannot be a temporary action—it must continue when once started.

We believe the act goes too far toward governmental control and that it would be well to try a more limited act whereby industry would be able to work out its own salvation. We believe the emergency that business faces results from decreased purchases and stagnant markets and is not one of internal readjustment. But we have passed the opinion stage—the Congress has made a revolutionary law.

What should business do? Each trade association should act at once to develop a positive program. A code of ethics and one for business practice should be made. Each association should institute cost accounting and provide for the compilation of statistics on production and sales. Steps should be taken to arrive at price agreements, production agreements and even territorial sales allocations. Action by the trade associations should be used to forestall direct action by government and to develop the partnership implied in the law.

We hope electrical manufacturers, wholesalers and retailers will go to work under the new law and develop their plans and programs. We know of the difficulties that must be faced by each of these trade associations in attempting to start a program that carries out the law. But there is nothing to gain by standing still or by waiting for the government to act, and there is much to gain by going to work in a full spirit of confidence and co-operation. We believe the permissive powers of the government will be used administratively only in the degree that industry fails to act for itself through its trade associations.

The meeting of the National Electrical Manufacturers Association at Hot Springs failed to bring about definite action, but the members did give authority to the board of governors to act. It is to be hoped that quick action will follow after members have reacted to the concrete proposals embraced in the Swope plan and the committee plan. Quick action and a full spirit of co-operation are the essential elements to safeguard the industry from unwise intervention by government officials.

The three answers to the merchandising policy question

THIS matter of merchandising policy involves a lot more than the mere question of whether or not a power company should continue to sell appliances. The real issue is the future of domestic load in the community, and the possible income from residence customers for the next five years.

If the general public was sold on the use of electric appliances for cooking, heating and labor saving the situation would take care of itself. The power company could just step out and end the whole argument with the dealer and the politician and people could buy elsewhere. But that is not the case. For most families today use only a flatiron and a vacuum cleaner. The other appli-

ances may be appealing to them, but are not considered important. So they don't buy them. Most power company men fail to realize this, however, because they themselves have so long considered the clothes washer, the refrigerator, the toaster, the range and other appliances essential articles of equipment for the modern home. Therefore, they have always underestimated the problem involved in marketing this equipment, on which the growth of domestic load depends.

It is true that the public can buy the appliances from the department, hardware and furniture stores and the electrical dealer. But this line of merchandise is still in that early stage where people don't buy. They must be sold. These appliances must tease their way into the home today. They must be advertised, demonstrated and followed up. It is expensive pioneering that doesn't pay the dealer and he won't do it. He would rather let the business grow slowly and at less expense. He is not concerned with building load.

The power company must follow one of three courses—it can aggressively sell appliances that increase residence consumption; it can quit merchandising itself and abandon all effort to build up domestic income, save as it slowly develops through increasing popular demand, or it can deliberately organize a co-operative relationship with local dealers that will gradually develop an adequate number of strong retailers, supported with such special services as only the power company can and should supply, since they are essentially designed to hasten the growth of load.

Whether the utility will or will not merchandise in such a co-operative program will depend upon the local plan. It may or it may not. But the experience of several cities proves that it cannot quit without building up dealer sales to do the job. It is a process that requires several years in development, however.

Business curves turn upward

BUSINESS men are encouraged and stimulated by the upward turn of nearly all business guides. Steel operations, electric power production, car loadings, commodity prices, building contracts, brokers' loans and the stock market —all have improved steadily at a greater than seasonal rate. No one knows why business is better or how long it will continue to improve; in fact, there is almost an incredulous astonishment to find that the facts exist. Such is always the case when business guides turn up or turn down.

Present business facts are encouraging. A gain of 10 to 15 per cent in business will change the entire electrical industry situation from one of penury to one of some prosperity. Expenses have been cut to the bone in all branches of the industry and operations have been adjusted to the 1932 level, so that any increase of business means profits and more employment. Business needs sales and is getting them.

Utility taxation overdone

UNDOUBTEDLY Congress and several state legislatures propose increased taxation on the light and power industry from a punitive viewpoint—a sort of soak-the-utilities attitude. Very little is done or has been done to show the fallacy of this attitude and the vicious effects of such taxation on national prosperity. Few legislators would agree, offhand, that they desired to crush the utilities as the railroads were crushed, yet this is what punitive taxation does.

Utility profit margins are small. Utility securities are held by nearly 2,000,000 stockholders and banks and insurance companies have a large proportion of their investments in utility bonds. And beyond the effect that unjust taxation has upon these investors is the fact that a prosperous local utility means community development. Expansion of service, decreased cost of service through modernization, introduction of new appliances to the public, participation in civic improvements or benevolent enterprises — all these cease when profits turn into deficits.

We believe utility executives, utility security holders and local civic leaders should speak out frankly and firmly when legislators attempt to burden an industry unfairly and in a punitive mood. There has been too much silence. The utilities do not merit castigation and it is very bad policy to permit malicious persecution to be unchallenged when this involves the welfare of so many individuals and communities. Utilities should cheerfully pay their fair share of taxes, and they do so, but there is a direct responsibility upon executives and security holders to protect their interests and those of the public they serve when fair taxation turns into punitive taxation.

Production for Profits

By D. R. STEVENS
Vice-President Okonite Company

No antidote needed for competition. Industries should be permitted to organize for profits. Unbridled competition leads to waste and expense.

MUST we have war as an antidote for *competition?* I can't believe it. What other antidotes can there be to get my mind to operate backward, to get it off this idea of getting rid of labor? The answers are not difficult. They lie before our eyes, but we are lost in a maze of economic raving:

1. There are natural correctives at work, but they are very, very slow.

2. The American voter can correct his own error at once.

By natural correctives I mean that by looking at my own factory statistics the investment figures tell their own story. No matter what the news tells us about the machine age, I haven't bought any real machinery in two or three years. For the simple reason that machinery won't pay for itself when there is neither price nor profit on the goods. Now cessation from buying machinery means that the march of the "machine age" is checked. And existing machines are doomed to rust when a man discovers that he can make a living at small operations with hand labor while the big fellow with the machinery is drifting into bankruptcy. All this is going on. Big corporations are closing down non-profitable plants, the expensive machines are standing as idle as unneeded Muscle Shoals. Too bad? Well, man is still boss. Not the machine.

But all this is so slow that the effects on a factory manager's mind are hardly noticeable. He would still try to get rid of labor if there were any gain to be had. But there isn't. He is now down to skeleton crews that he must keep possessed of. And nature, still applying her correctives, has started the public to cry for sharing of work, shorter hours and other movements which even stop the sales managers from asking factory managers for further savings. So nature is just working at the old game of survival of the fittest.

But the restorative that can be applied by the American voter will be for him to correct his own errors. The Sherman anti-trust law of thirty years ago may have eliminated the monopolies of that day, but it is causing the unemployment of this day, because it is ceaselessly echoing, "Thou shalt compete."

I should like to get my mind off of the labor-saving idea. All the zest in my work has disappeared. And the sales manager still tells me day by day that there is no bottom, and that if I cut out all the labor it wouldn't help much, so I might as well forget it.

But when an order comes in on a patented article, that is a horse of another color. Both price and profit can be maintained on a patented article. And even though the orders don't flow in every day, when they do come I know that there is profit ahead.

I had some such last summer. Eagerly I went at the job. I never gave a thought to holding labor down. I determined to show our competitors that we could do a big job in shorter time, of better quality, than they could. I ordered a lot of new accessories for the shop and had my men working day and night and Sundays and established a world's record on the job. My labor bill was a bit costly. But I didn't care and neither did my employers. There was good profit in the job and we had built new good will with our customers.

That is what happens every time I have a price with profit. More skilled labor is used, more care, higher quality and renewed endeavor.

But of course everything we make is not patented—only a little bit of the great whole in industry is patented. And patent rights expire in seventeen years. That law seems to be good for patents. If it had been applied to the Sherman anti-trust laws we might not be in this mess today.

If the American people will stop our sales managers from telling me to cut cost, cut cost, cut cost, then I'll get my mind off of getting rid of labor and have many more profitable things to think about. And I think by this time that the purchasing agents, the engineers and the general managers would agree with the laid-off employee (not the forgotten man, but the man who has forgotten) that it's time to let the factory manager right about face and march away from the center of the scroll where employed men vanish to zero and toward the outside where employment is more normal.

The minute our chains are struck off factories will begin to fill up—not all at once, but slowly and surely, as the factory manager's mind relaxes from the labor question and as public opinion swings over and favors price and profit and expanded use of man-power. No inflation is proposed and the American people do not have to go back and make monopolies legal. Monopolies are not necessary.

The Sherman anti-trust laws and the rules of the Department of Justice which enforce the law provide for preventing unfair competition. But one never hears of

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In a series of three articles* Mr. Stevens discusses present business conditions from the point of view of a factory manager. His personal experiences and his intelligent comments are worthy of serious study by the industry. These articles are contributed as a part of the editorial program of "Electrical World" to render constructive aid to the electrical industry in meeting new conditions.—EDITORS.

*See ELECTRICAL WORLD, *May 13, for first article.*

the laws being used for this purpose. All that the factory manager ever hears is that officers of the company will go to jail if they reach an understanding with their competitors. And the Department of Justice has its hands full policing a few hundred thousand manufacturing companies.

The voters of today should permit industry to "regulate its own competition." Let industry have a profit if it can get it. Take away the supreme power from the purchasing agents and there may be a seller's market. Manufacturers might no longer feed off each other's corpses.

Organize for profit

I propose that each industry should be permitted to organize for profit if it can do so. Let these firms of industrial engineers do some real industrial engineering. If an industry desires to try to stabilize price and profit let it elect the services of firms like Ford, Bacon & Davis, Sanderson & Porter, or Stone & Webster, and many others large and small. Let it say, "Gentlemen, we want you to establish uniform accounting and fair price lists for our industry. We want you to educate us against overexpansion and debt. We want you to educate us and educate the public that sales below those prices do not carry a fair margin of profit and are unfair to labor. We want you to invoke the unfair competition sections of the Sherman laws and have the Department of Justice act against extreme offenders." The Department of Justice could watch a couple of hundred industrial engineering firms easier than it can police a couple of hundred thousand manufacturers.

Can the reader see the white collar men being called back to work by these industrial engineers, the establishment of fair price lists, the cessation of civil war, the purchasing agent shorn of his now unwanted power, the sales manager with a fighting chance to sell on a quality and service basis at any price he can get above an established fair price, and, finally, the factory manager secure in the knowledge that orders should carry a fair price and profit and that there no longer exists any need for constant planning to eliminate labor?

Lifting of prices alone might start buying and reemployment. No panacea can be expected, but that brutal competition could be stopped.

Life insurance companies operate on established lists for the mutual benefit of the policy holders. No insurance is sold at a sacrifice and our insurance companies are among the few sound industries we have left. Manufacturers should be allowed the same privilege and mutual benefit should result.

Just fair competition

I am not advocating the return of the trusts. They might gobble up my employers, and I don't know if that would be good or bad for me. My memory tells me that Teddy wanted to regulate the corporations—not to strangulate them. And the lawmakers of his day must have recognized the danger of competition because they wrote clauses as to unfair competition. Those are the clauses I want resurrected and used today.

I am not advocating price fixing—just the establishment of fair lists. Let general managers compare notes and costs and policies all they want to. Let them regulate their own competition and strive to establish a profit. Price fixing by government is bad, but attempts at price control by industry are quite a different thing. Every one knows that even with the lid removed industry would have trouble holding together with gentlemen's agreements. But let them try to employ these industrial engineers to keep them in health and to educate the public that buying below cost brings unemployment.

As long as my employers make a profit they will never look twice at the number of men I employ. And I'll be glad to have a few helpers back where I am now running complicated machinery with one man just to satisfy competition. It would be no trick at all for me to carry 25 per cent more men—not on account of increase in sales or shorter hours, but for manning the plant with a standard personnel. And my research departments are always asking for more men—white collar engineers, etc. My own secretary is doing double duty at least. Remember, my labor cost is so low that an increased payroll doesn't affect cost very much.

Our government will never balance the budget trying to find new ways to tax us $2 when we have only $1 in our pockets. Nor will they ever put our unemployed to work on government projects. For a while I thought the general sales tax was the best way out. Now I see it as only an added amount for the consumers (and unemployed) to pay. Let industry have that same amount toward profit after fair prices are established. If industry can establish suitable profits then employment will gain, employees will have money to spend and government will have something tangible to tax.

Profitable industry doesn't even howl about the cost of government. Funny, isn't it—government threatens to jail industry for finding a way to make a profit. Industry winds up broke after years of unbridled competition. Then government has to cut its own expenses and put itself on the unemployed list because there's no money coming in to pay itself with. If Teddy were here he would see to it that the law operated right.

Start recovery at home

One more word and I'll close this chapter and let economists tear it up. I'd like to see my country be high-minded and able to solve all the ills of the world, but it would be better to start the solution at home and be a visible example.

If we want to live "without price or profit" we can go to China. If we want to try to straighten out America we should keep our fences up until we get a surplus. When we get a surplus we can experiment with high-minded ideals as long as the surplus endures. Am I talking about debts and tariffs? Sure. But only as unemployment is affected.

We should do what we can with the debts. If we can't collect them we should learn to live without that income, but not release the debtor. If he can't pay let him go through the orderly process of default or bankruptcy. If we establish a healthy trade with our own people we should not let the debtor convince us that if we'll only let him have our home trade he'll pay us off some day. We should forget the debtor before we give up our own living. We had his promises before. Let us develop our own prosperity, and then if we feel good and he has tried hard to observe the ethics of a debtor we can consider giving him a helping hand with his problems. We must not forget that we will never achieve that comfortable position if we let him have our home trade.

The debtor will probably forget the ethics of a debtor.

He'll probably retaliate on that home trade idea. But we never had more than 10 per cent of our business with him even in good times. Let him keep it. If we eliminate brutal competition at home we must not permit it from abroad.

If we are able to solve our problems at home we will find plenty of ways of securing trade relations in times to come. The world will always make a beaten track to our door even if we live in the heart of a forest—providing we can make a better mouse trap.

Brutal competition is a terrific expense.

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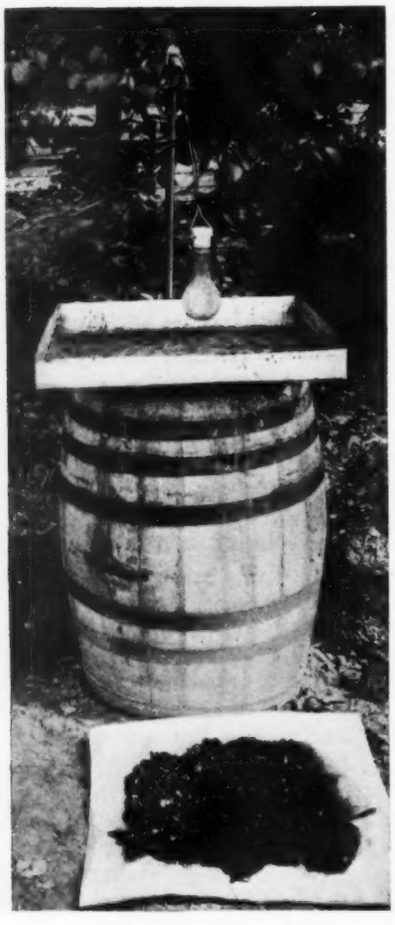
Destruction of Insects by Light Traps

By M. LUCKIESH

Director Lighting Research Laboratory, General Electric Company, Cleveland, Ohio



An insect "catch" from light trap

Entomologists have estimated that insects cause an annual loss of $2,000,000,000 in the United States, or the equivalent of the labor of more than 1,000,000 men. The possibility of using light to attract insects to traps where they may be destroyed has been recognized for many years, but no complete systematic study of the subject has been made. One objection has been that such a method destroys beneficial insects as well as injurious ones, but tests have shown that, in some cases at least, the latter greatly exceed the former in number.

Several types of traps have been used. A simple and effective trap consists of a bare incandescent lamp suspended just above a vessel containing water covered with kerosene. The best mounting height above the ground depends upon the type of insects to be destroyed. Other traps have been devised in which insects attracted to lights are killed by electrically charged screens. Flytraps operating on this principle are being manufactured by a Chicago firm.

It seemed of interest to experiment with light traps to determine their effectiveness in catching insects and particularly to investigate the relation of candlepower to the catch. The best results were obtained with a shallow pan about 25 in. square, mounted about 3 ft. above the ground and with a tungsten filament lamp a few inches above it. Many moths and other insects were caught, but no attempt was made to classify them. Identical traps with 25-watt and 100-watt bare tungsten filament lamps were tried. The one using the 100-watt lamp caught more insects than the other, but not four times as many. However, since the labor cost of installing and maintaining such traps is probably far greater than the cost of electrical energy, our tests would indicate that the use of the larger lamp might be justified.

Although we have not carried on experiments with colored light in the traps, in the present state of knowledge we see no good reason for using colored lights. There probaby is no color preference excepting that determined by the color vision of the insect. We see no reason for altering the color of the light source, but would present to the insect all the rays. It will see what it can see.

The use of light traps for the destruction of insects provides a use for light and electricity and seems worthy of further investigation. Light traps are not likely to be economically beneficial in all cases, but where damage from insects is great they appear to be worthy of trial. There are a few cases on record where large savings in crops have resulted from their use.

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Unit Figures on Oklahoma Rural Use

The monthly operating cost of electric equipment secured on 22 Oklahoma farms under actual farm conditions and published in Oklahoma Agricultural Experiment Station Bulletin 207 indicates that electricity may compete with other sources of power in saving the farmer time and money in the business of farming and in addition supply the home with modern conveniences.

Lights represent the most popular use of electricity on the farm, the average consumption of which is 35 kw.-hr. per month, which differs little from that of the city home. Electric service, unfortunately, often is not economically justified for lights alone, since due to the low farm home density the farm must bear the corresponding service cost of a number of city homes.

The monthly consumption of 1.1 kw.-hr. for the house water supply, 58.6 kw.-hr. for refrigeration, 2.7 kw.-hr. for washing clothes, 1.62 kw.-hr. per cow for milking, 2.15 kw.-hr. for cooling 100 lb. of milk, 0.8 kw.-hr. per 100 lb. of feed ground and 47 kw.-hr. per 1,000 eggs incubated represents a cost above that for service of only the power charge. It is in the use of such equipment, says Earl R. Miller, research assistant in rural electrification, that the solution of low-cost electricity for the farm home lies. If by its use the farmer can save time and money, then the unit cost of electricity for the farm will be no greater than that for the city home, and the conveniences of electric service in the home will be available to many farmers who cannot otherwise afford them.

Industries Gain in South and West

For the first time in many months industrial plants in the South and West are operating at a higher general average of activity than during the corresponding period of the preceding year. As was pointed out in the May 20 issue, the same thing holds true for the country as a whole. In both of the regions under consideration, however, the April returns on kilowatt-hour consumption show a somewhat greater excess over the activity of April, 1932, than that registered in the remainder of the country. In both regions, also, there was a sharp recovery from the sag recorded for March.

Southern chemicals, foods, iron and steel manufacture, metal working, paper, rubber and textiles are higher than a year ago. Increased activity in construction work appears to be indicated by the progressive rise in the stone, clay and glass group. In metal-working, except for the peculiar spurt in February, there is as yet little indication of any tendency to advance from the persistently low level of recent months. Comparison of the returns from individual establishments reveals conflicting movements —gains in some are canceled by losses in others.

Western gains over 1932 occurred in the important food industry, in the metal industries, paper and pulp, and shipbuilding. Disparities in others were not large enough to overcome the upward influence of those groups. Steady progress is to be noted in the metals group, which has been very low, while the stone, clay and glass group also has a rising trend.

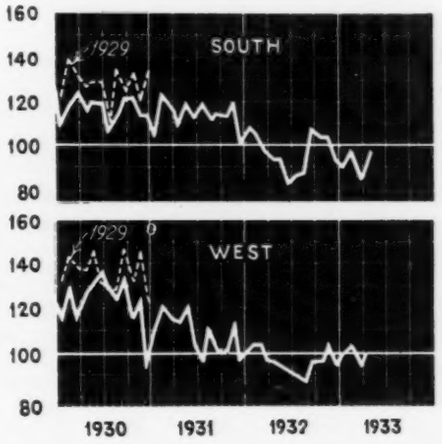
Index of monthly manufacturing activity, South and West

Base: Average month 1923-1925 = 100

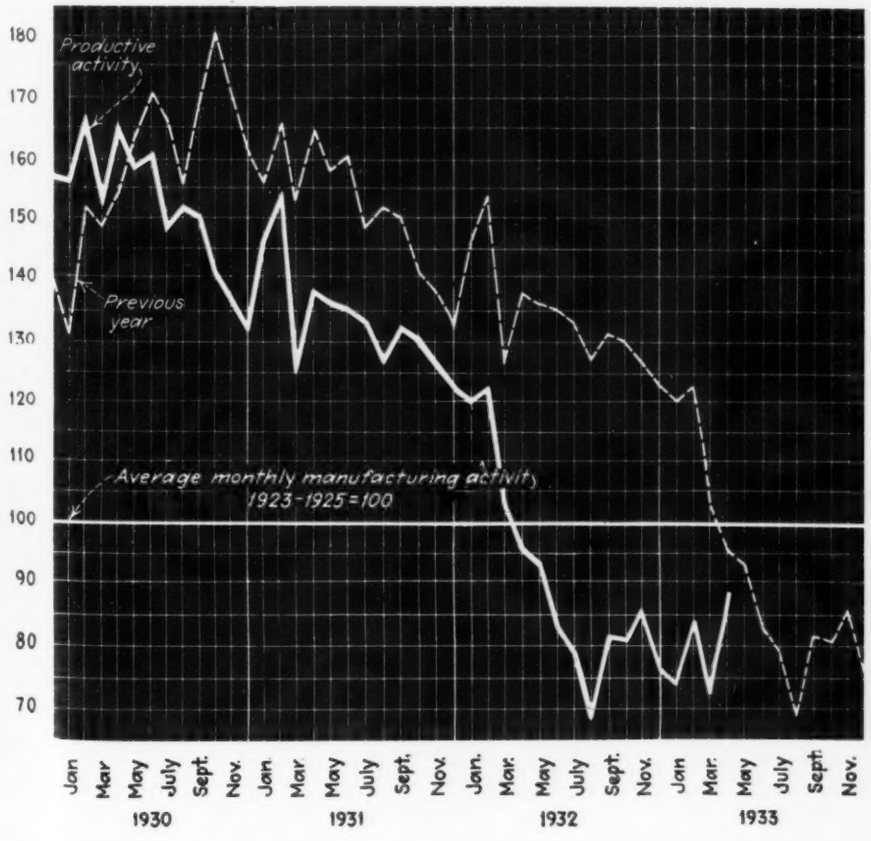
(Corrected for number of working days, but not for seasonal variation)

	South					West				
Industrial Groups	April, 1933	March, 1933	Feb., 1933	Jan., 1933	April, 1932	April, 1933	March, 1933	Feb., 1933	Jan., 1933	April 1932
All Industry	**98.5**	**85.9**	**99.3**	**90.1**	**89.7***	**102.0**	**95.8**	**102.0**	**100.0**	**96.2**
Chemicals	128.7	124.7*	132.5	132.7	117.0	78.0	71.9	79.8	78.2	82.7
Food products	148.2	127.2*	131.5	128.0	127.8*	122.1	108.3	118.2	116.2	114.8
Iron and steel	98.5	60.3*	82.7	81.7	76.0	.....	.....	.....	.....	.....
Metal working	62.3	63.6	85.7	59.3	59.8	.....	.....	.....	.....	.....
Metals group	82.7	61.8*	84.0	71.8	69.0	50.3	45.4	44.8	44.6	38.0
Forest products	37.2	28.4	37.6	36.6	44.5	137.8	136.7	144.8	145.7	128.0
Paper and pulp	135.4	133.5	158.0	137.7	134.1	130.0	111.0	127.0	138.4	134.0*
Rubber products	101.7	73.0*	109.3	57.3	64.3	56.2	27.9	46.8	76.2	99.0
Shipbuilding	.....	.....	.....	.....	.....	105.4	96.3	122.3	107.3	100.7
Stone, clay and glass	129.0	109.0*	103.8	73.0	148.9	89.9	109.3	83.7	78.0	96.6
Textiles	106.8	94.7*	119.3	101.5	85.6	.....	.....	.....	.....	.....

*Revision.



Electrical Shops Busier



Work in electrical manufacturing plants picked up sharply in April, it appears from reports of electrical energy consumption in such plants received by the ELECTRICAL WORLD. The rise was in marked contrast with the downward trend a year ago and indicates a rate of operations only 6.5 per cent below that of April, 1932.

Viewed in longer perspective it is evident that the low point was reached last August, and that despite subsequent fluctuations the movement since that time has been definitely upward. The recent increase was most pronounced in the smaller establishments, especially those engaged in the manufacture of domestic appliances.

Monthly Index of Electrical Manufacturing Activity

Adjusted to 26 working days

Base: Average Month, 1923-1925

Month	1930	1931	1932	1933
January	156.2	146.6	120.0	74.0
February	165.2	154.3	122.2	83.3
March	153.0	126.1	102.9	75.0
April	164.9	138.1	95.6	89.4
May	158.0	136.7	92.8	....
June	160.2	135.2	83.1	....
July	148.5	133.4	79.2	....
August	152.2	126.9	67.6	....
September	150.0	132.6	81.4	....
October	140.6	130.4	80.9	....
November	137.5	126.9	85.6	....
December	132.4	123.5	76.0	....

Progress in Mitigating Cable Sheath Electrolysis

By FRANK E. REEVES* and CHARLES F. AVILA†
Edison Electric Illuminating Company of Boston

THE solution of the ordinary electrolysis problem where metal is removed from an underground structure by stray electric railway negative return current is generally quite simple. The structure is usually bonded to tracks, negative return feeder or the negative bus in the railway substation at which the current originates, the object being to maintain the structure being attacked at the same potential as, or slightly negative to, the structure to which the current is flowing.

The average potential of the structure under discussion with respect to any other nearby underground structure is determined, within limits, by the size of bond or drain wire. In cases where a comparatively long wire must be used some method must be employed which will give the proper size. It is undesirable to drop the potential of the structure to such a low negative value that other structures will be unduly exposed to electrolytic action.

When direct bonding proves inadequate

Let us consider a case where underground lead cable parallel to street car rails is to be protected from electrolytic action. Assume that experiment shows that a direct bond between sheaths and rails will not lower the potential of the sheaths sufficiently to protect the cables in the entire district, and it is necessary to run a wire from the sheaths to the negative bus in the railway substation.

One method for estimating the proper size of wire to be used consists of determining the amount of current that must be taken from the cable sheaths to lower their potential one unit of voltage. This is accomplished by installing a temporary drain wire from the cable sheaths to the car rail or negative return feeder with an ammeter and switch in series with the wire. A voltmeter connected from the sheaths to the rail is read immediately before and after closing the switch (Fig. 1) and the ammeter is read simultaneously with the second voltmeter reading. Load changes caused by the starting and speed changes of cars or trains are a source of error.

The current in amperes divided by the change in voltage gives the number of amperes to be taken from the sheaths per volt of change in potential, and if several sets of readings are taken an average figure will be obtained which can be used to calculate the proper size of wire. The average value of voltage from the rail at the point where the readings are taken back to the negative bus must be determined. Then, knowing the amperes per volt drop, the potential at which the sheaths should be maintained above the negative bus and the distance to the ultimate draining point, the resistance of the drain wire can be calculated. In addition to the source of error mentioned above, this method also assumes that the curve of cable voltage against current drained is a straight line. Checking this against the results obtained in the second method proves that this is not always true of that portion of the curve which is normally used and that it is never true when the limits of the curve are approached.

By reproducing actual ultimate drain conditions, and by taking simultaneous readings, both of the errors of the first method are essentially eliminated. A number of high-capacity storage cells are connected so as to aid current to flow from the cable sheaths to the rail (Fig. 2). The variable resistance in the circuit permits the raising or lowering of average voltage between sheaths and rails, and when a particular setting of average voltage has been made simultaneous readings of A, V_1, and V_2 are taken. The practice has been to take several readings for each of six settings of V_1, namely, —0.4, —0.3, —0.2, —0.1, 0, +0.1 volt. The minus sign indicates that the sheaths are negative.

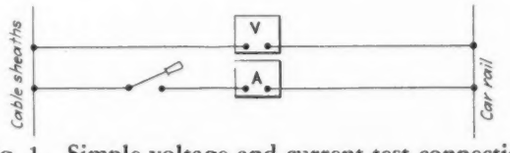


Fig. 1—Simple voltage and current test connections between sheath and rail

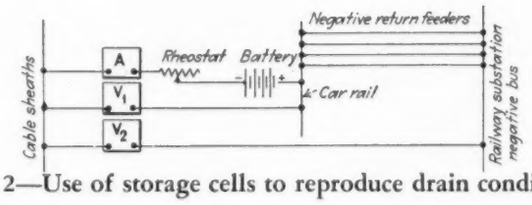


Fig. 2—Use of storage cells to reproduce drain conditions

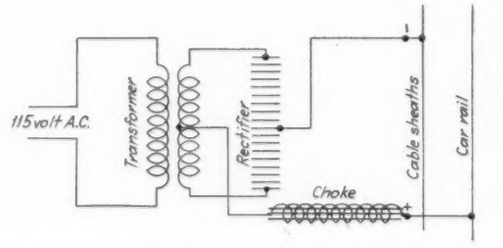
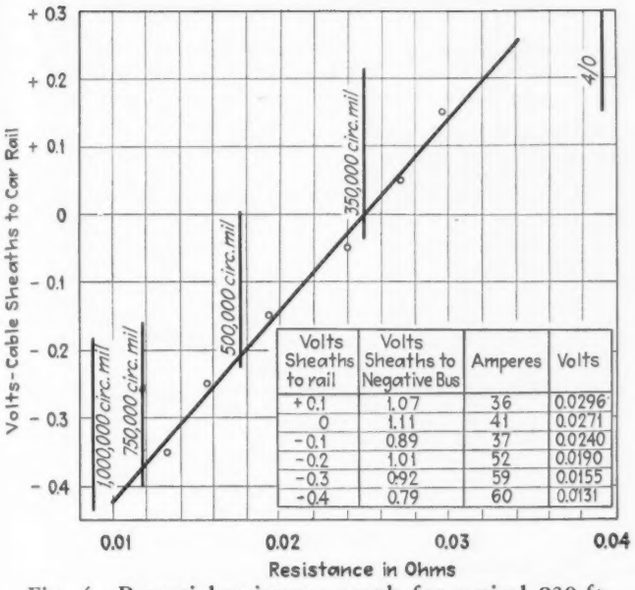


Fig. 3—Application of copper oxide rectifier to making sheath negative to rail

**Standardizing and testing department. †Maintenance of lines department.*



Volts Sheaths to rail	Volts Sheaths to Negative Bus	Amperes	Volts
+0.1	1.07	36	0.0296
0	1.11	41	0.0271
-0.1	0.89	37	0.0240
-0.2	1.01	52	0.0190
-0.3	0.92	59	0.0155
-0.4	0.79	60	0.0131

Fig. 4—Potential-resistance graph for typical 830-ft. drain wire. Test period, 30 minutes

It is usually necessary to try different numbers of storage cells to obtain the desired range of voltage.

The six average values of resistance obtained $\left(R = \frac{V_2}{A}\right)$ are plotted against the six values of V_1 and a curve is drawn. A typical curve is shown in Fig. 4. Knowing the length of the proposed drain wire, the sizes of wire can be plotted on the curve so that it will be possible to deduce from the curve the size of wire necessary to maintain the sheaths at the desired average potential with respect to rail. Voltmeter 1, which is shown connected from sheaths to car rail in Fig. 2, could be connected from sheaths to water main, gas main or any structure to which the cable sheaths are exposed, the curve of resistance plotted against average settings on this voltmeter and the size of wire selected to maintain the sheaths at the desired potential with respect to that structure. Similarly, the voltmeter could be connected to read voltage to the water in the manhole or to a plate buried in earth and the size of wire selected to make the sheaths negative to the surrounding earth.

Tests should be made while normal load is being carried by the nearby railway substations. If the tests are made under light load conditions and the wire size is selected to maintain a certain potential negative to some particular structure, then when the substation takes on more load the sheaths will become more negative to that structure, and if the wire size is selected to maintain a positive potential increased loading will make the sheaths more positive.

The error introduced by feeding the test current into the negative return system is appreciable in some cases. In Fig. 5 a 7.5/15-volt electroplating generator coupled to a 115-volt single-phase motor was used in place of a battery to provide a more reliable source of energy and lower the potential of the sheaths below that obtainable with the available battery. As the generator was of the shunt type, a battery was connected in series with the armature to provide proper excitation voltage.

To compensate for the error due to the test current in the negative returns the following method was evolved: Immediately after the test data is taken for the curve a reading of average voltage drop over the negative returns is taken over a complete car cycle with the battery circuit open. This will be referred to as the open-circuit voltage.

Referring to Fig. 2, V_2 reading minus V_1 reading is the drop over the negative returns. For a particular setting of V_1, the amount by which V_2-V_1 exceeds the open-circuit voltage is the amount the test current has raised the potential of the car rail. If the curve be used in selecting a wire size to maintain a particular value of V_1, when the wire is installed the sheaths will be found to assume an average value of $V_1 + (V_2 - V_1 -$ open-circuit voltage) or $V_2 -$ open-circuit voltage. Therefore, by raising each point of the curve vertically by an amount equal to $V_2 - V_1 -$ open-circuit voltage or by plotting $V_2 -$ open-circuit voltage above each point the points for the corrected curve are obtained.

By extending the original curve to the zero resistance axis a point is obtained which represents the theoretical potential of the sheaths with respect to car rails if a zero resistance or infinite cross-section drain wire were used. Under this condition the sheaths would, of course, be at the same potential as the negative bus and the ordinate of this point should equal the drop over the negative returns. Therefore, the open-circuit voltage may be plotted on this axis and the point may be used as a point on the corrected curve. At this point the two curves should have their maximum separation and should

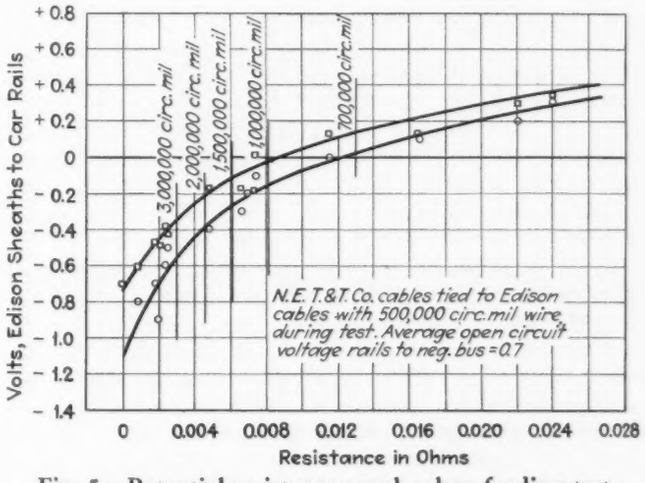


Fig. 5—Potential-resistance graph when feeding test current into railway negative returns

V_1 Average Volts Sheath to Rail	V_2 Average Volts Sheath to Negative Bus	Amperes Total Current	Ohms Resistance	V_2-0.7
+0.3	1.05	43	0.024	0.35
+0.2	1.00	45	0.022	0.30
+0.1	0.814	49	0.0165	0.114
0	0.83	72	0.0115	0.13
—0.1	0.72	97	0.0074	0.02
—0.2	0.50	72	0.0070	—0.20
—0.3	0.525	79	0.0066	—0.175
—0.4	0.53	111	0.0048	—0.17
—0.5	0.275	114	0.0024	—0.425
—0.6	0.32	131	0.0024	—0.38
—0.7	0.23	123	0.0019	—0.47
—0.8	0.092	114	0.00081	—0.61
—0.9	0.21	106	0.0020	—0.49

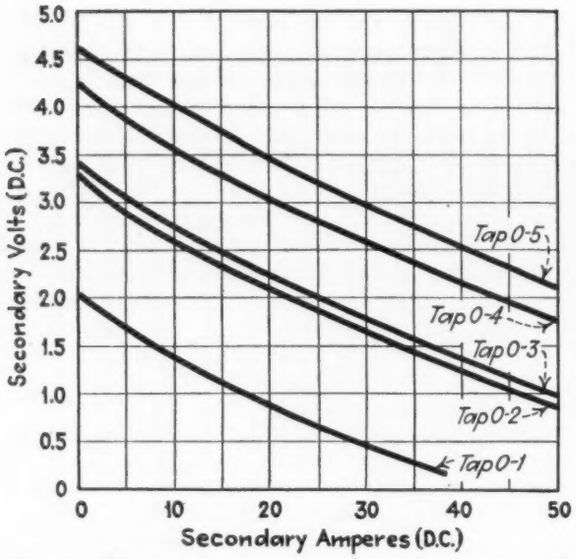


Fig. 6—Direct-current output for primary taps of copper oxide rectifier

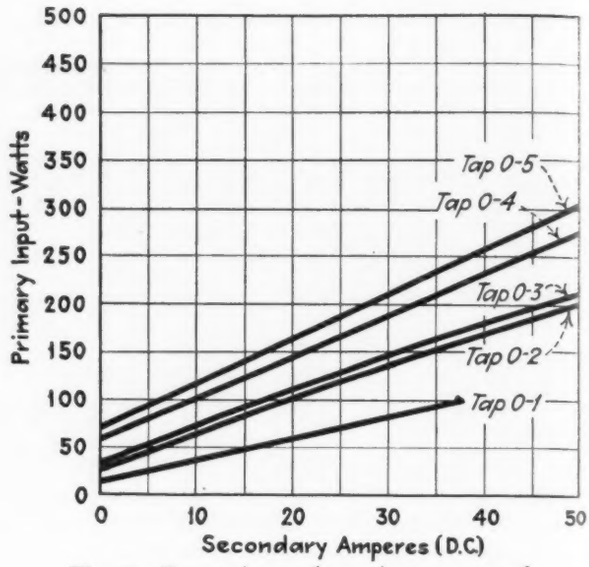


Fig. 7—Power input for primary taps of copper oxide rectifier

gradually converge until they intersect at the horizontal line which represents the potential of sheaths with respect to rails if no drain wire is used. Since the original curve is asymptotic to this line the two curves will intersect theoretically at infinity. This converging feature of the two curves can be seen in Fig. 5.

The method described above does not entirely eliminate error from the test. Installation of a drain wire always results in a redistribution of current, the negative returns taking less by the amount of current in the drain wire. The effect of this change is to make the sheaths more positive than was anticipated. If a considerable proportion of the negative return feeders run to remote rail taps the greater part of the change in current will probably be absorbed by these remote feeders and the error will be small.

The results of battery tests which were made in different districts are given in the table below.

This principle of lowering potential of underground structures can be utilized in the form of permanent installations for electrolysis mitigation where it is not practicable to remedy conditions by installing an ordinary drain wire. In a certain district cables ran parallel with water mains with a separation of only a few feet. The water main was lower in potential than the cable sheaths and there were several electrolysis failures. Permission could not be obtained to bond to the water main, although it was found by trial that only a few amperes would flow into the water main. At a point about a half mile from the district where the trouble occurred these same cables approached a street railway line, but the potential of the sheaths at this point was alternately above and below that of the rails, so that bonding to these rails was of no value. Tests were made using a battery and temporary drain wire between the sheaths and rail to determine the amount of current and voltage which would be necessary at this point to make the sheaths negative to the water main where the electrolysis action was taking place. These values were used in considering which of three types of installation would be desirable, namely, (1) storage cells with permanently connected charger; (2) a motor-generator, or (3) a copper oxide rectifier and transformer.

Type 1 was discarded because of the high maintenance factor involved. The essential details of types 2 and 3 were turned over to manufacturers of motor-generators and copper oxide rectifiers for comparative costs. It was found that a specially built motor-generator would be necessary and that the cost of such a unit would be excessive.

Laboratory tests were made with a copper oxide rectifier and oscillograms showed that with a rectifier connected as in Fig. 3 a fairly pure direct-current wave was obtained. Without the choke a pulsating direct-current resulted. A field test was made at the location mentioned above and the apparatus was found to be satisfactory, so a submersible type unit with taps to permit a choice of current and voltage values was ordered.

The 50-amp., 1.0-volt unit for permanent installation is contained in a standard 5-kva. submersible transformer case with bushings for wiped lead cable connections. The transformer primary is equipped with five taps for obtaining different outputs and the characteristics of the different taps are shown in Fig. 6. The power input curves are given in Fig. 7. It can be seen that at full load the input is 210 watts and the efficiency of the unit is about 24 per cent.

Battery Tests of Voltage Drops

District	Size of Wire Installed (Circ. mil.)	Average Volts, Sheaths to Rail With no Drain	Calculated	Result	Ratio of Calculated Change to True Change
Somerville.....	500,000	1.60	—0.26	—0.20	1.03
Ashmont.....	1,000,000	1.20	—0.10	—0.30	0.87
Harrison Square...	1,000,000	0.60	—0.40	—0.80	0.71
Coolidge.....	1,000,000	2.20	—0.10	—0.40	0.88
Dewey Square....	2,000,000	1.10	—0.04	—0.02	1.02
Roslindale.....	2,000,000	2.80	—0.10	—0.05	1.02
Dudley Street*....	2,000,000	1.30	—0.20	+0.10	1.25
	1,000,000	1.10	—0.10	—0.10	1.00
Average ratio.....					0.97

*Tests at this location were made simultaneously at two manholes to obtain data for two drain wires.

Billet Scale Removed with Relay-Controlled Spray

By R. M. BOYLE

Industrial Engineer
Westinghouse Electric & Manufacturing Company, Chicago.

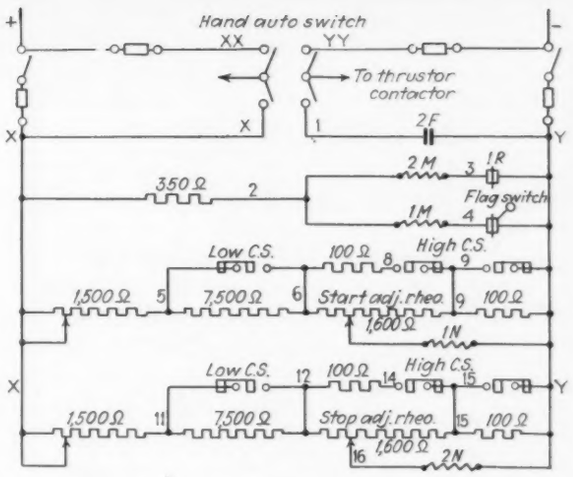
Billet automatically controls high-pressure spray

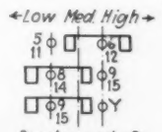
As the hot slab enters the scale breaker stand the limit switch riding on the center of the piece energizes a timing relay which controls the 1,000-lb.-per-square-inch water spray housed on the far side of scale stand.

AN AUTOMATIC electrically operated water spray is used by the Inland Steel Company, Chicago, to insure complete removal of scale from steel slabs during the rolling process. The initial unit was such an improvement over previous manual operation that the remaining spray stands have recently been automatized.

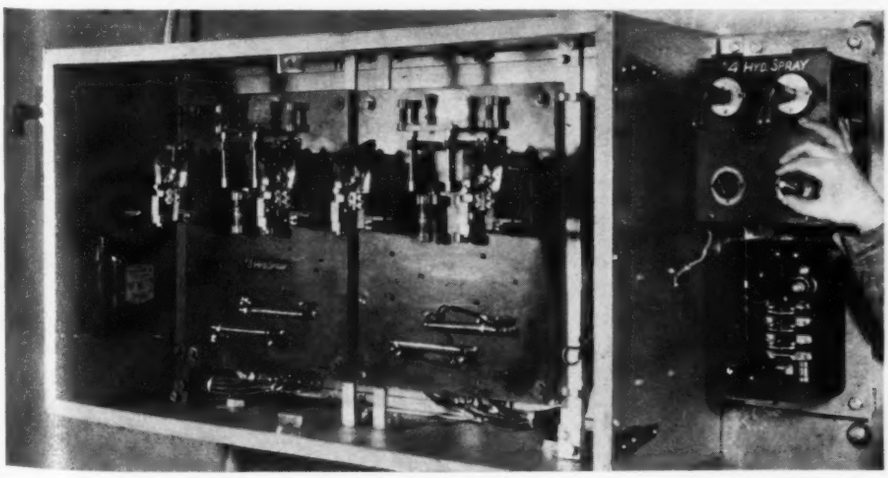
In this new wide hot-strip mill of the Inland Steel Company slabs are rolled into hot strips by means of a continuous four-high mill. In the early operations the slab receives several roughing passes and between these passes all displaced scale is removed by means of a hydraulic spray using water at a pressure of 1,000 lb. per square inch. This spray has little effect on the temperature of the body of the slab, but rapidly cools the end. This is objectionable, since it is desirable to keep the ends as hot as possible to facilitate easy entry into the roll passes and to prevent scoring and breakage of the rolls.

During the initial operations of this mill a man was stationed at each of the three sprays to turn on the spray just behind the leading end of the slab and turn it off just before the end of the piece. This operation is now





Development of time selector control switch



Limit switches control spray time

When the control switch is closed and the transfer switch in the mill thrown to the automatic position time-relay 1 will pick up and time-relay 2 will drop open. When a billet entering the scale breaker opens the flag switch the main coil (2-4) of time-relay 1 is de-energized and after a definite time will open closing "break" contacts (3-Y), which energize the main coil of time-relay 2. The "make" contacts of time-relay 2 (1-Y) energize the thruster contactor, which opens the spray valve. With the proper adjustment the spray starting can be timed to strike the billet just behind the advance end.

As the billet leaves the flag switch time-relay 1 main coil is energized and opens break contacts (3-Y). This de-energizes the main coil of time-relay 2. After a definite adjustable time time-relay 2 opens its contacts [1-(—)] de-energizing the thruster, which closes the spray valve. This adjustment is made to turn off the spray just before the end is reached.

Two switches control start and delay of spray

being done automatically by two timing relays and an ingenious network of resistors, which permits the use of a radio type rheostat for adjusting the time interval.

In operation the oncoming slab strikes a limit switch which energizes the first timing relay. After a definite adjustable time the hydraulic spray is turned on so that the spray reaches the steel just behind the advancing end. When the end of the slab releases the limit switch the second timing relay functions and holds the spray energized just long enough to spray the entire length of the piece and stop before the trailing end passes under the spray. Timing can be varied from one-half to three seconds. Sufficient time adjustment is provided for the starting and stopping time to permit operation over the normal mill rolling schedules.

This simple scheme has released three men for more important duties on the floor and has provided an entirely automatic device which functions with far more accuracy than hand control. Previously, in times of emergencies, when the spray operator's attention had been attracted by some other operation in the mill, a slab would be improperly sprayed. This scheme has entirely eliminated the possibility of an occurrence of this kind as it works entirely automatically.

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Basis for Determining Sales Effort Justified

A hopeful sign that economic analysis is being applied to the solution of sales problems as it has been done with profit in engineering.

By J. D. FRANTZ
General Electric Company, Portland, Ore.

How much time can the central station expend in an effort to secure the small electric heating loads of 10 kw. and less? If it were possible to answer this question correctly it would probably show that a few utilities are spending too much time, while a majority are spending too little time in this important revenue bearing field. Since men and their time are of first consideration, the question naturally resolves into: "How many man-hours can be profitably expended for each kilowatt-hour of consumed power?" In a more simplified form this question becomes:

X = man-hours/kw.-hr.
"X" represents the value—"How many."

Example: If "X" equals a number such as 0.002, then our expression would be 0.002 man-hours/kw.-hr.

The unknown "X" in this expression contains four important variables, which may be called a, b, c, and d. They are:

(a) The average rate of revenue for these small loads of 10 kw. and less.
(b) The per cent of expected revenue the central station is willing to spend to secure the load.
(c) The chances of securing the business.
(d) The equivalent value of a man-hour in dollars.

In an effort to develop a formula for "X" which could be used effectively, it would not be feasible to consider in detail all factors which deal with the subject. However, (a) "The average rate of revenue" and (d), "The equivalent value of a man-hour" are factors which can be quite easily and accurately determined and need not be elaborated upon.

Under (b), "The per cent of expected revenue the central station is willing to spend to secure the load," is the place where all items, except a, c and d, which have any effect on the problem either directly or indirectly should be grouped. A few of these we will consider. The advertising value of the small heating loads must be considered because these loads furnish the means of demonstrating to the customer the versatility and convenience of electric heat. Results of the economical and satisfactory operation of small heating devices will often induce the customer to purchase and install heavy-duty equipment which he might not do otherwise. Under this term, allowance should be made for the low overhead expense involved. Contrast the overhead of the small industrial heating unit with home appliances and devices such as toasters, percolators, vacuum cleaners, refrigerators and ranges. These devices require elaborate salesrooms, capital for stock, extensive credit and billing systems, all of which reduce the net profit. Industrial heating units are inexpensive and a small sample kit or literature will serve for the salesroom.

Also, this item should be credited in that idle generating and distribution equipment have fixed charges which must be offset by new revenue. Against this should be charged the cost of the investment to serve the new load. It should be remembered, however, that even though these loads may be insignificant in the beginning, they may be large when excess capacity is used up and usage is more extensive.

Any other conditions which would affect our formula should be included under this item (b), thereby keeping our formula as simple as possible. Many central stations state that 10 to 15 per cent is a fair value for this term.

Under (c), "the chances of securing the business," should not merely be a percentage of the actual number of propositions on which work has been done, but should also take into account both the size of the job and the time spent. In brief, assume two propositions. The first, a 5-kw. job required ten hours; the second, a 10-kw. job, required twenty hours. The first makes 50 man-hour-kilowatts while the second, 200 man-hour-kilowatts. Their sum totals 250 man-hour-kilowatts. Had the first job only been secured the value of (c) would be 20 per cent. The second job only gives a value of 80 per cent. The results of the last ten jobs, whether they were secured or not, should give a fair and representative value for this term.

In the above four terms all the percentages should be expressed as decimals and all the money values in dollars.

As an example, assume:

(a) The average rate of revenue of 2 cents per kilowatt-hour.
$a = 0.02$
(b) The central station is willing to spend 10 per cent of the expected revenue.
$b = 0.10$
(c) The chances of securing the business are 50 per cent.
$c = 0.50$
(d) A man-hour is equivalent to 75 cents.
$d = 0.75$

The formula now may be derived. Should there be no expense whatsoever in the generation, distribution and sale of electricity and no profit expected, then the central station, in order to secure the load. could spend the full value of (*a*) for each kilowatt-hour delivered to the consumer. In the above assumed case the central station could spend 2 cents for each kilowatt-hour delivered. These no-profit and no-expense conditions of course do not exist and we must reduce our values of (*a*) by multiplying by the "per cent the central station is willing to spend" and by "the chances of securing the load." Therefore, the amount of money the central station can spend for each kilowatt-hour delivered is the product of *a, b* and *c*. Dividing this product by *d*, "the equivalent value of a man-hour," will give us the number or "How many" man-hours that can be spent for each kilowatt-hour delivered to the consumer.

$$\text{Hence } X \text{ equals } \frac{a\ b\ c}{d} = 0.00133$$

The original expression then becomes:

0.00133 man-hours per kw.-hr. of expected load or
1.33 man-hours per 1,000 kw.-hr.

Assuming a man-day could be expended profitably for each 5,000 kw.-hr. of load added and that a 2-kw. load operating eight hours per day, 26 days a month for two years will consume 10,000 kw.-hr., a man could well afford to work two days in an effort to secure this 2-kw. load, based on the assumption that it will be on the line for only two years.

After obtaining a fair value of *"X"* as outlined above. it will be a simple matter to determine in advance how many man-hours can be devoted to a new proposition, regardless of whether or not the load is finally connected to the line. This is done by multiplying the value of *"X"* by the contemplated number of kilowatt-hours that the installation will consume. Of course the total consumption cannot be definitely determined, but a comparison with past installations of similar nature will provide a basis from which a reasonable assumption can be made.

Naturally, the value of *"X"* will vary and will be different for each utility and each locality. But it will show whether or not sufficient effort is being expended to secure the small electric heating loads, a bread-and-butter item for the central station.

From another point of view, it has been estimated that, as a revenue builder, a 1-kw. industrial heating load operating eight hours per day is equal to the average domestic range. Consider, however, the cost of connecting these respective loads to the lines. Except where a number of ranges can be grouped together, the range requires a 5-kva. transformer, a watt-hour meter, new copper from the pole to the house and expensive rewiring within the house. While in contrast, the 1-kw. heating load can usually be connected to an already existing circuit in the industrial plant by using a switch and a few feet of wire and conduit. The range does show an advantage of high gross profit, but comparing the overhead expense of range sales with that of small industrial heating equipment and considering the favorable revenue-producing power of the latter, it is apparent that sales effort expended in building this class of load will produce desirable returns in increased revenues.

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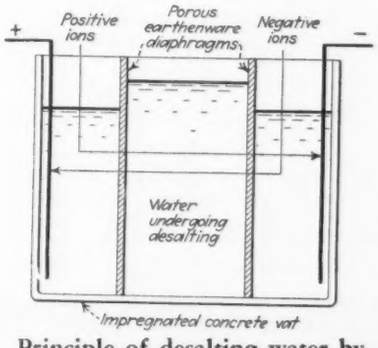
Desalting Brewery Water by Electro-Osmosis

Water containing magnesium salts is very objectionable in brewing beer, as it leaves unpleasant after effects and prevents the addition of the large proportion of hops necessary in producing light-colored beer of the Pilsner type. An electrical method for removing this or other salts that dissociate in water has been developed in Germany by Siemens & Halske which depends for its operation on electrically stimulated osmosis. According to Rene Leonhardt of Berlin the energy consumption is about 2 kw.-hr. per hectoliter. Water containing 125 mg. of magnesium salt per liter has had its content reduced to one-tenth this figure by electro-osmosis. In every case Mr. Leonhardt reports the osmotized water yields a far more tasty and agreeable beer. Furthermore, the process does not remove other constituents of water which are desirable.

The apparatus employed involves the use of electrolytic cells, each divided into three parallel compartments by porous diaphragms, the central compartment receiving the water to be desalted and the outer compartments containing the anode and cathode, respectively, which attract the salt ions through the porous diaphragms by electro-osmosis, as the process is called. The water in the central compartment progressively loses its salt content, while the impurities concentrate in the electrode compartments. By maintaining a higher water level in the central compartment than in the electrode compartments two advantages are obtained: (1) There is continuous flow into the electrode compartments for flushing them; (2) there is less tendency for the water undergoing purification to be contaminated by impurities collected in the outer compartments.



Principle of desalting water by electro-osmosis

To make the process a continuous one, instead of a batch process, and also to achieve more thorough purification than could be obtained in single cells, several cells are arranged in cascade so that water undergoing purification flows from one cell to the next by gravity.

With eight cells in cascade 100 hectoliters of water can be treated per day, Mr. Leonhardt reports. Larger quantities can be handled by operating several cascades in parallel.

Impregnated concrete cells with porous earthernware diaphragms, operating at 110 or 220 volts direct current, are used. The earthenware diaphragms do not remove salts as thoroughly as textile diaphragms, but they are easily cleaned with water and a brush and have been found sufficiently satisfactory for purifying brewery water, reports Mr. Leonhardt.

Pyranol Affords Far Smaller Secondary Network Units

By H. R. TURNER* and W. T. McLACHLAN†
General Electric Company

AS NEW buildings have been constructed in secondary network areas, it has become desirable to locate the network transformers and protectors in vaults within the buldings, often at various floor levels, in order to reduce the amount of secondary copper and to improve the voltage regulation of the secondary circuits. Since the transformer equipment used oil as its insulating and cooling medium, strict limitations were applied on both the location and construction of these vaults, increasing the cost of installation. It was evident that if these limitations were removed vaults could be simplified and built in more convenient locations, with probability of material reductions in over-all installed cost. The answer to this problem has been found in the development of transformers suited to the use of "Pyranol."

Pyranol is a new, non-inflammable insulating and cooling medium, and being considerably more expensive than oil, it was desirable to reduce as far as possible the amount of this liquid contained in the transformer. Careful study resulted in the design of single-phase transformers with the volume of liquid reduced by as much as 35 per cent, thereby lowering the cost differential between Pyranol-filled and oil-filled transformers to a value which, in many cases, is offset by savings in building vault construction. Many of these transformers are now in service in building vaults.

*Pittsfield, Mass. †Schenectady, N. Y.

Now applied to three-phase street vault units

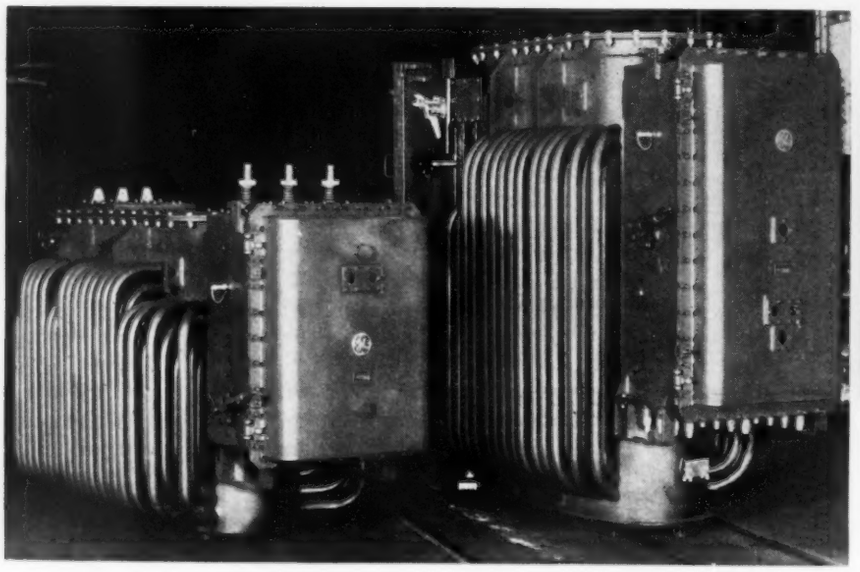
Similar study of three-phase network units for use in street vaults has culminated in a development which is believed to mark a major advance in the design of secondary a.c. network equipment, namely, a Pyranol-filled, three-phase, 500-kva., 27,000/216 Y-volt secondary network unit with marked reduction in dimensions and a 50 per cent reduction in the volume of Pyranol required. This development involved:

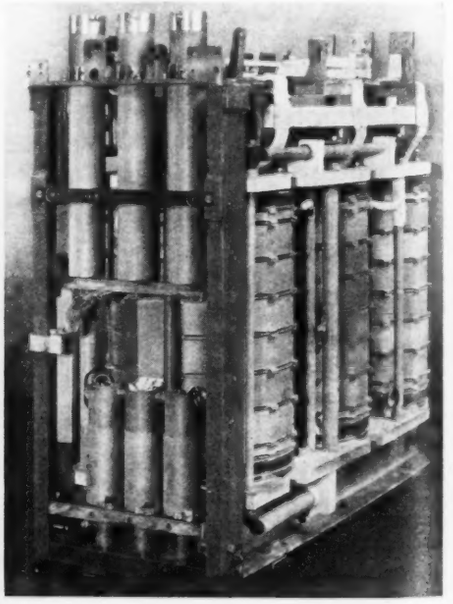
1. A new method of connecting the high-voltage feeder cables to the transformer.
2. A new grounding and short-circuiting switch.
3. A modified assembly of the ratio adjusters and means for their operation.
4. A new arrangement of the network protector.

High-voltage feeder cables are brought into the transformer through wiping sleeves in the cover. A plug connector attached to the end of the cable conductor is inserted in a segmental-type socket contact which is the terminal of the high-voltage winding. This method of connection eliminates the need of a high-voltage junction

Pyranol-filled network unit 30 per cent smaller

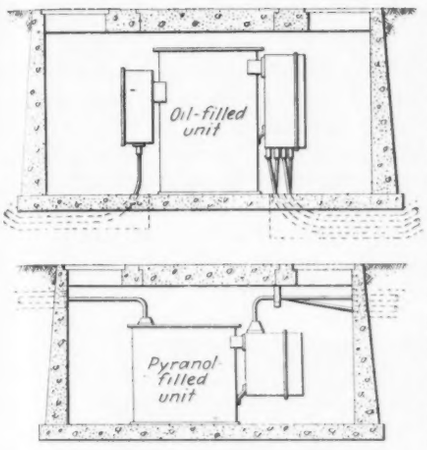
Both are three-phase, 500 kva., 27,000/216 Y units, Pyranol-filled on the left, oil-filled on the right. Height reduced from 88½ in. to 60 in., length from 106½ to 102 in.; width increased only 4 in. Network cable terminals are located at the top of the protector case, eliminating the space previously required below the case for cable installation.





Transformer interior is compact

High-voltage terminals, grounding switch and ratio adjuster in vertical arrangement conserve space; this assembly is attached to one end of the core and coils and becomes an integral part of the transformer internals.



The Pyranol-filled network unit can be installed in a vault 7 ft. deep, 4 ft. 2 in. wide and 14 ft. long. Vaults of such small dimensions should permit obtaining vault space in locations which could not previously be used. Existing vaults may often be used without major reconstruction. Cable terminal facilities allow short runs of cable, without extensive racking and bending, from ducts entering near the vault ceiling. Difficulties of installing cable with previous units caused many companies to lower duct entrances to the floor with greater duct and excavation cost.

Vault construction and installation costs reduced

box and simplifies and reduces cost of installation as it is unnecessary to remove junction-box covers or the insulating liquid.

The grounding switch is arranged to ground and short circuit the feeder cables at the transformer terminals. The moving member comprises three plugs, which are raised simultaneously to enter three socket contacts. The moving element is actuated through a gear mechanism by an operating handle located outside of the tank. The design is such that the magnetic forces set up by short-circuit currents will not open the switch. An electrical interlock is provided to prevent moving the switch when the transformer is energized. The grounding switch, although located in the transformer tank, is accessible for inspection and the contact assembly may easily be removed. The ratio adjusters are grouped together and are operated simultaneously from a single handle by means of a gear train.

New interlock gives added safety

To increase safety to workmen, previous network units have been provided with an interlocking device to prevent access to the ratio-adjuster handle unless the transformers are de-energized and the grounding switch is in the ground position. In this new unit an interlock between the grounding-switch mechanism and the ratio-adjuster mechanism automatically prevents movement of the ratio-adjuster handle unless the switch is in the ground position; it also prevents subsequent clearing of the grounding switch unless the adjuster is in one of the several tap positions.

Transformer connections enter the protector case near the top through the conventional throat to which the protector case is bolted. The main current-carrying circuit is brought downward from the transformer terminals to a point below the breaker contacts and is looped upward through the contacts and fuses to the network terminals. Access to the bolted connection between the transformer terminal and the protector bus is gained by removing the fuse, together with a removable section of the bus which connects the fuse to the network terminal. Submersible porcelain bushings permit external connection of network cables and may be arranged to accommodate from one to four cables per phase. The low-voltage neutral of the transformer is brought out near the top of the tank adjacent to the protector and is carried by a bus supported on the protector case to a point in line with the protector network terminals.

Reconstruction of vaults avoided

The first cost of installation of a secondary a.c. network system will in many cases be substantially reduced because existing vaults can be used with only minor changes instead of completely reconstructing or building new vaults. Since the primary feeder and the secondary network cable connect to the top of the unit, the cost of running duct lines and installing the cables is reduced. Ducts at the usual levels enter the vault near the terminals of the unit, so that a minimum of cable is required. Racking of the cable is simplified and the number of cable bends reduced. In cases where with previous network units ducts were brought to the floor of the vault, with the new unit the expense of excavation can be diminished by bringing the ducts in at a higher level.

Many companies have adopted the practice of installing transformers and network protectors in separate vaults. Pyranol being non-inflammable, with the new network unit the major reason for separate vaults is eliminated. In such cases the use of combination units offers marked savings by reduction in total vault space, substitution of single vaults for double vaults and the elimination of cable between the transformer and protector and provision for mounting protector separately.

These savings in vault construction and installation expense should offset the higher cost of the Pyranol-filled unit, so that its installed cost will be comparable with or lower than that of the oil-filled design, at the same time providing the outstanding advantage of non-inflammability.

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Mining Company Saves with Ball Bearings

By FRANCIS A. WESTBROOK

Careful records and tests made by one of the largest Eastern mining companies in the non-ferrous metal field have shown that by using ball bearings for certain machines there have been savings of 92 per cent in the cost of lubricant, 84 per cent in the cost of labor for lubrication and 75 per cent in repair costs. In addition to this there have been savings in power consumption, and the elimination of shut-downs for repairs has not only simplified operating management but also has done away with wasted time due to the enforced idleness of the workers. The result of the experience of this company has been that it is now standard practice to purchase motors and machinery equipped with ball bearings for all new applications and replacements. The results leading to this standardization are described in the following paragraphs:

A number of motors, varying in rating from 1 to 125 hp., were first equipped with ball bearings. Some of them were new and others were old motors which had the sleeve bearings replaced with those of the new and up-to-date type. The 1-hp. motors were connected to small fans, others were belted to line shafts, some direct-connected to pumps and still others were used on mine

locomotives. In some cases these motors operate sixteen to 24 hours a day, under normal conditions. One of the great advantages attributed by the company to ball bearings is that they are sealed against the entrance of dust, which is particularly prevalent in the mines and the cause of much trouble and damage to shafts with sleeve bearings. Such bearings are also sealed against leakage of oil, which means that they require less lubricant and less attention. The fact that they keep out water is also important in many locations.

Motors are not the only pieces of equipment on which ball bearings have been used with success. For instance, the governors on two small turbines have been provided with such bearings, as well as forced-draft fans, some of which are direct-connected to steam turbines and others to motors by silent chains.

One of the most successful applications has been on centrifugal pumps and the motors driving them. One of these units was equipped with a 100-hp. motor. The wear of sleeve bearings permitted the impeller of the pump to drop and either decrease its efficiency or, if left too long, cause excessive wear. Ball bearings do not wear in this way, at least if of proper design for the service, and the improvement in operation has been very marked. There is another thing about ball bearings which is of great importance, and that is their self-aligning feature. As centrifugal pumps are generally direct-connected to their motors any misalignment which takes place is liable eventually to result in trouble, especially with sleeve bearings which will wear and cause wear of the shafts. Slight misalignments are almost impossible to avoid due to warping of castings, changes of temperature, etc., particularly under the severe service conditions incident to mine operation. Consequently the self-aligning properties of ball bearings of the type used here have been of great value.

Thus when it comes to plant modernization ball bearings may be made to play an important part because they can often be substituted for sleeve bearings in existing machinery, and the return on the investment is very attractive. Figures have been compiled to show the savings on six 35-hp. motors which were re-equipped with ball bearings after several years of service with sleeve bearings. It was found that the cost of lubricating material was reduced for these six motors from approximately $22 a year to less than $2 a year, representing a saving of about 92 per cent. The labor of oiling was reduced from about $89 a year to about $14 a year, amounting to 84 per cent. Repairing of sleeve bearings was also an expensive matter formerly because they had to be replaced on the average about every four months on account of the dust to which they are exposed. For the six motors under discussion this cost about $81 a year. The cost of repairs after the installation of the ball bearings has averaged only $20 a year, a saving of 75 per cent.

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British Output Doubles in Six Years

British electric utility plants doubled their output in the six-year interval ended in 1930; kilowatts of installed capacity increased to 7,140,375 from 3,972,737, or 80 per cent; horsepower of prime movers, 78 per cent; revenue, 50 per cent. By the shift in application of steam the kilowatts driven by turbines rose from 3,574,062 to 6,765,646, while those driven by reciprocating engines declined from 338,492 to 168,722; 206,007 kw. were driven by other prime movers in 1930, against 60,183 kw. in 1924.

Other changes are revealed in the preliminary report, on electricity undertakings, of the fourth (1930) Census of Production, abstracted in the accompanying tables published by the London *Electrician*. Reports were received from 201 companies and 276 local authorities, 477 in all. Electricity generated was 11,758,000,000 kw.-hr.; purchased by producing companies, and by local authorities and distributors only, 2,762,000,000 kw.-hr. Corresponding amounts in 1924 were 7,324,000,000 kw.-hr. and 578,000,000 kw.-hr.

Comparative Data, 1930 and 1924

	1930			1924		
Particulars	Companies	Local Authorities	Total	Companies	Local Authorities	Total
Value of electricity sold and work done (£000)	25,744	36,417	62,161	15,472	25,588	41,060
Cost of materials used (£000)	10,413	12,608	23,021	6,366	10,254	16,620
Net output (£000)	15,331	23,809	39,140	9,106	15,334	24,440
Average number of persons employed	28,980	46,350	75,330	17,105	31,925	49,030
Net output per person employed (£)	529	514	520	532	481	498
Mechanical power available:						
Prime movers (hp.)	3,997,017	5,771,479	9,768,496	1,803,329	3,702,159	5,505,488
Electric motors driven by purchased electricity (hp.)	1,685	1,554	3,239	295	6,688	6,983
Electric generators:						
Ordinarily in use (kw.)	2,451,483	3,609,389	6,060,872	1,034,907	2,095,155	3,130,062
In reserve or idle (kw.)	452,617	626,886	1,079,503	280,109	562,566	842,675

Electric Energy Supplied in Great Britain

	1930		1924		1930				1924			
					Companies		Local Authorities		Companies		Local Authorities	
Electricity Supplied	Million Kw.-Hr.	Value £000	Million Kw.-Hr.	Value £000	Million Kw.-Hr.	Value £000	Million Kw.-Hr.	Value £000	Million Kw.-Hr.	Value £000	Million Kw.-Hr.	Value £000
For public lighting	164.8	1,137	79.5	733	22.5	206	142.3	931	10.0	91	69.5	642
For traction	1,782.7	5,052	940.9	3,974	1,001.4	2,358	781.3	2,694	361.1	1,221	579.8	2,753
For power and manufacturing purposes	5,036.4	17,643	1,998.1	9,628	2,068.0	7,058	2,968.4	10,585	586.1	3,101	1,412.0	6,527
For lighting, heating and domestic purposes	2,646.0	28,727	1,272.1	17,217	745.9	9,806	1,900.1	18,921	505.5	6,605	766.6	10,612
Miscellaneous (e.g., to non-statutory undertakings)	237.6	324	.....	.....	219.1	226	18.5	98	.....	.....	.....	.....
Bulk supply to authorised distributors	2,450.0	6,163	863.4	2,836	1,921.1	4,976	528.9	1,187	704.1	2,338	159.3	498
For purposes not separately distinguished	58.9	390	887.4	5,362	44.4	321	14.5	69	284.0	1,673	603.4	3,689
Total	12,376.4	59,436	6,041.4	39,750	6,022.4	24,951	6,354.0	34,485	2,450.8	15,029	3,590.6	24,721

March Operations Reflect Business Disturbance

As was to be expected in a month of financial disturbance and of somewhat irregular operation of industrial plants, the revenue of electric light and power companies in March fell off by rather more than the usual seasonal amount from February. Returns received by the ELECTRICAL WORLD indicate a total for the entire United States of $151,920,000, or 4.2 per cent less than in the preceding month and 9.7 per cent less than a year ago.

Despite the adverse conditions the spread compared with 1932 is only slightly greater than it was in February. Operating and maintenance expenses, $64,550,000, were approximately the same as in the month before, and down 8.7 per cent from last year. It may not be out of place to point out that the revenue was only 11 per cent less than in the corresponding month of 1929, and that it was off by less than 14 per cent from the highest March revenue on record—that of 1930.

Energy output, amounting to 6,227,000,000 kw.-hr. on the basis of statistics collected by the U. S. Geological Survey when deductions are made for the output of plants not regarded as central station operations, fell 8.7 per cent short of last year's at this time. While the percentage in February was somewhat larger, the comparison is distorted by the extra day in that month last year. When that is taken into account the showing for March is less favorable than for February.

This was foreshadowed by the weekly estimates announced by the Edison Electric Institute, which revealed a decided sag during the first two weeks of March. The effect of the subsequent recovery should be evident in the monthly figures when the report of output for April is published. It can scarcely show up in the revenue until the returns for May can be compiled.

Regional comparisons indicate that the largest disparity against 1932 again occurred in the East North Central States, both as to revenue and as to output. In the Middle Atlantic, West South Central and Mountain States the revenue approached that of last year a little more closely than in February.

The reduction of output from last year was in most sections taken chiefly from the fuel-generated portion, particularly in the South Atlantic, where hydro output was larger than in 1932.

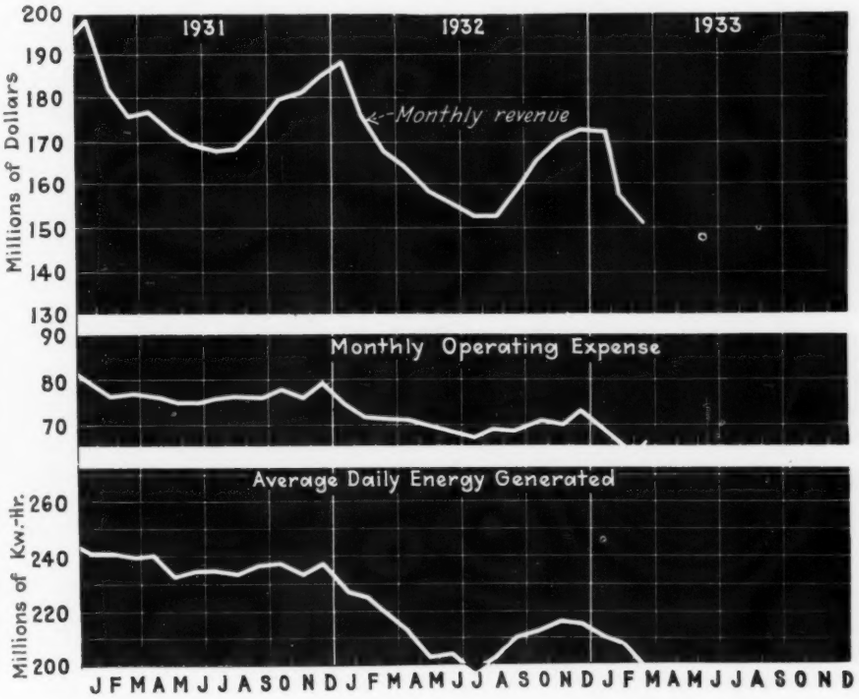

1931
1932
1933
Millions of Dollars
Monthly revenue
Monthly Operating Expense
Average Daily Energy Generated
Millions of Kw.-Hr.
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

Table I—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1932	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
December	6,662,849	— 9.4	2,578,552	— 0.2	4,084,297	—15.0	1,982,000	+ 3.5
1933								
January	6,535,574	— 7.8	2,828,265	— 3.8	3,707,309	—10.5	1,820,000	— 3.0
February	5,904,348	— 9.9	2,534,466	— 9.6	3,369,882	—10.2	1,534,000	— 8.5
March	6,227,103	— 8.7	2,858,897	— 1.8	3,368,206	—13.8	1,604,000	— 6.0

Table II—Regional Revenue, Energy Output, in February, 1933

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	151,920	— 9.7	6,227,103	— 8.7	2,858,897	— 1.8	3,368,206	—13.8
New England	16,830	— 8.5	404,089	—11.2	227,690	— 4.3	176,399	—18.8
Middle Atlantic	41,690	— 8.7	1,609,537	— 9.7	548,866	— 1.1	1,060,671	—13.5
East North Central	34,420	—12.4	1,392,730	—12.7	193,380	— 6.6	1,199,350	—13.6
West North Central	12,600	—10.0	424,717	— 8.0	155,212	— 5.7	269,505	—10.2
South Atlantic	16,780	— 7.4	816,181	— 2.7	584,659	+ 8.4	231,522	—22.7
East South Central	5,060	—12.1	263,061	—12.2	226,397	—11.2	36,664	—17.0
West South Central	8,060	—10.0	297,685	— 7.2	21,994	— 1.7	275,691	— 7.5
Mountain	3,610	— 9.1	190,810	— 9.0	143,908	— 9.2	46,902	— 8.0
Pacific	12,870	— 9.1	828,293	— 3.0	756,791	— 2.5	71,502	— 9.7

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

Table III—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*		Total Operating and Maintenanec Expense†	
	1932 Thousands	Per Cent Inc.	1932 Thousands	Per Cent Inc.
Dec.	$171,880	— 7.5	$72,350	— 8.8
	1933		1933	
Jan.	171,370	— 8.8	67,760	— 8.4
Feb.	158,620	— 9.4	64,460	— 9.5
Mar.	151,920	— 9.7	64,550	— 8.7

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.

†Does not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions.

Experience with Arcing Ground Suppressors

By E. M. K. SOMMER
Chief Engineer, A.-G. Sächsische Werke, Dresden, Germany

In the "Electrical World" of February 20, 1932, the reasons for the use of Petersen coils were given and the results of their installation on one of the great German electrical systems were discussed. In the present article Dr. Sommer gives the results of operating experience on another great German network, comprising some 1,300 km. of 100-kv. overhead lines and 2,200 km. at intermediate voltages from 3 to 40 kv.

IN NETWORKS with isolated neutral, unlike those with the neutral solidly grounded, a disturbance between one phase and ground does not constitute a short circuit. There merely results a capacitive current to ground, of a magnitude depending on the voltage and on the capacity of the metallically connected network. For example, in a 20-kv. network of 100 km. length it amounts only to some 5 amp., hence there is no necessity for an immediate disconnection. But with increasingly long lines and higher voltages the current to ground may become sufficiently large to necessitate a prompt cutting off of the disturbed section to avoid conditions that may be injurious to equipment and dangerous to life. To keep the ground current within safe limits under such circumstances a variety of arcing-ground suppressors have been put on the market. By causing a current to flow that is displaced about 180 deg. from the line current to ground they provide compensation for the latter at the point of failure.

The network of the regional system of the Aktiengesellschaft Sächsische Werke (A.S.W.), supplying the State of Saxony, now comprises about 1,300 km. of 100-kv. overhead lines and 2,200 km. of lines at lower voltages, ranging from 3 to 40 kv. For a number of years it was operated without arcing-ground suppressors. Because of the objectionable results of intermittent grounds, and especially the damage due to secondary overvoltages manifested far away from the point of failure on the primary, the A.S.W. decided to go thoroughly into the problem of suppressing arcing grounds.

As a result of careful investigations a beginning was made by equipping the entire metallically interconnected 30-kv. network, with a circuit length of some 380 km., with suppressors. These were put into operation at the beginning of the year 1926.

Since there was no known reason for preferring either one of the two methods best known in Germany, this network was equipped with Petersen coils of the Allgemeine Elektricitäts-Gesellschaft (A.E.G.) and with suppressor transformers of the Siemens-Schuckert Werke (S.S.W.).*

It may be pointed out that the Petersen coil is connected between the neutral lead of the transformer and ground, the suppressor transformer between three phases and ground. Since the suppressor transformer is a three-phase device, while the Petersen coil is a single-phase device, the former is naturally more expensive than the latter. Hence coils were used where suitable transformers were available with accessible neutral terminals, while suppressor transformers were used where it would have been necessary to provide new power transformers or special transformers if Petersen coils were to be used.

These conditions led to the purchase of four Petersen coils, each rated at 6 amp., three 7-amp. suppressor transformers and one 20-amp. suppressor transformer. From an affiliated company six additional Petersen coils were secured. At present the 30-kv. network is equipped with apparatus aggregating 112 amp. for suppressing arcing grounds for the compensation of current to ground of 89 amp. This protection has been distributed among fourteen pieces of apparatus and twelve stations, so that if any one station thus equipped trips out the consequent detuning of the network will be as small as possible.

The construction of the stations has dictated the putting of most of this equipment indoors; some units, however, are in the open.

In some of the plants a neutral bus has been installed. With the aid of disconnects this makes it possible to connect the Petersen coil to any transformer. Transformer neutral, the neutral bus and the coils themselves are insulated from ground for full line voltage. To that provision is ascribed the complete freedom from breakdown at these points during the entire six years.

All these suppressor devices have been installed for continuous operation. They are provided with a number of steps, whereby they can be adapted to various circuit arrangements of the network. In general, the Petersen coils are designed for 6 amp. with taps for 5, 4.2, 3.5 and 3 amp.; the suppressor transformers for 7 amp. with steps for 5.5 and 4 amp. Changes of connections of the latter devices are effected by means of the so-called regulating choke.

Operating statistics prove benefits

A simple scheme has been worked out for supervising the amount of compensation necessary under any given condition of the network. It consists of a gage panel and set of wooden blocks, corresponding to the lines and coils. A description of its use accompanies the illustration.

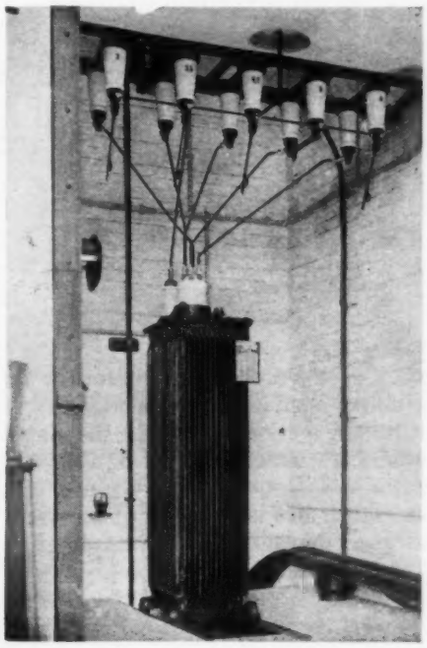
Since 1923 careful statistics have been kept of the

**For the theory of both methods see A.E.G. publication, "Protection Against Overvoltages by Means of Grounding Coils"; S.S.W. publication, "Protection by Suppressor Transformers Against Arcing Grounds."*

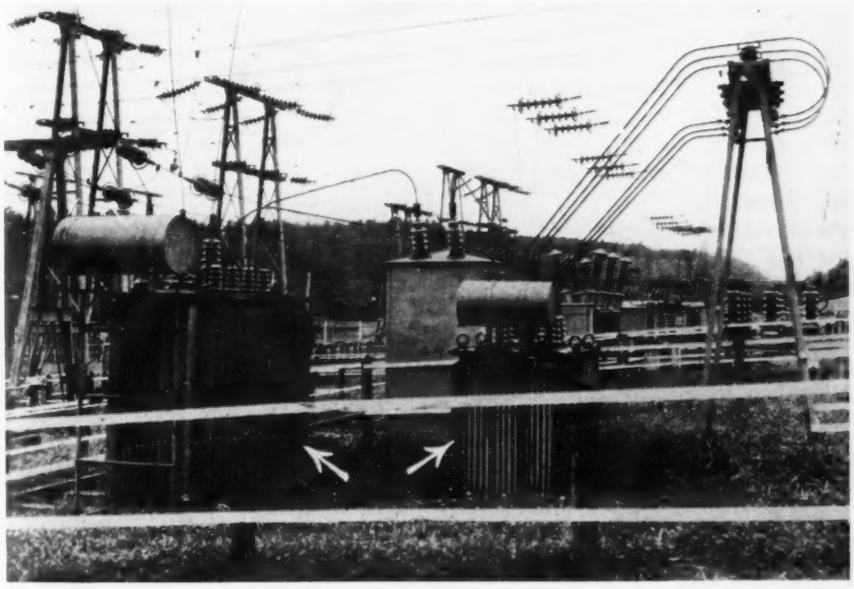
disturbances on this 30-kv. network. The results are of interest because they comprise three years of operation without protection against arcing grounds and five years with such protection. It might be assumed that the time of the change would be reflected in a sudden reduction in the number of disturbances. A specialist in the study of statistics of disturbances will not yield to this happy illusion. The number of disturbances is determined mainly by the frequency of thunderstorms. It cannot be expected that the protective devices will make lightning disturbances impossible. A chart of the disturbances will inevitably show pronounced maxima in those months and in those years when thunderstorms are more frequent. It is therefore quite possible that in consecutive months and in consecutive years the number of disturbances may vary by more than 100 per cent. No reliable way of eliminating this influence has been found, even by resorting to a ratio which takes into account the number of thunderstorms.

But if the average for several years before the installation is compared with a similar average for subsequent years the relative effectiveness of the protection can be ascertained. For the 30-kv. network the values have been ascertained for three years before and for five years after the installation of the suppressors. These show that the number of disturbances, referred to the same aggregate of lines in both cases, decreased by about 40 per cent.

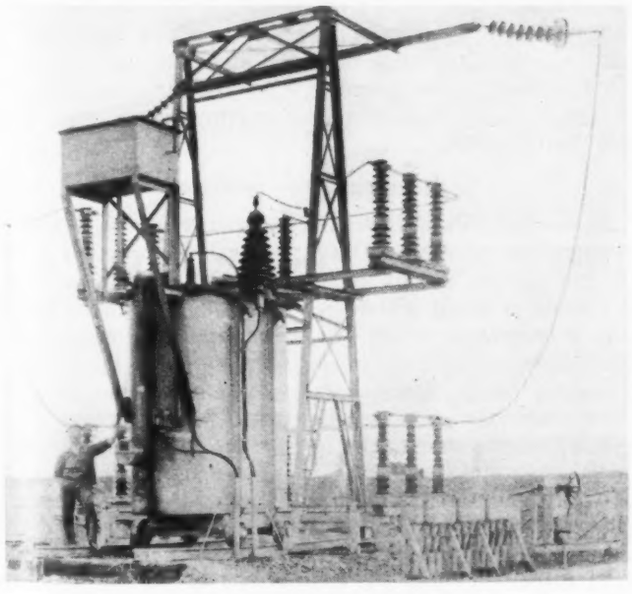
The disturbances on which this comparison is based



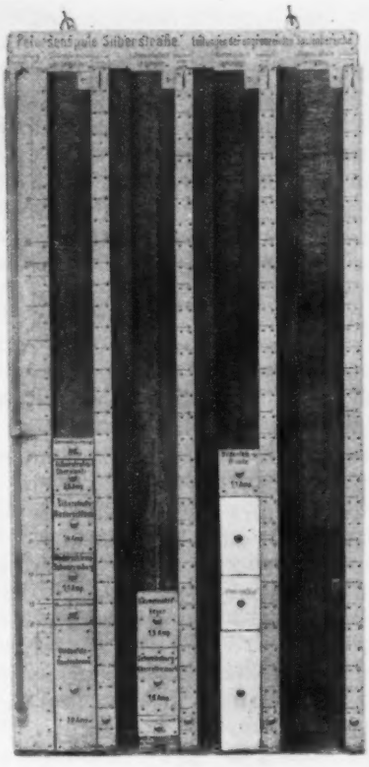
Petersen coil for 30 kv.



Suppressor transformer (left) for 30 kv. with regulating choke (right)

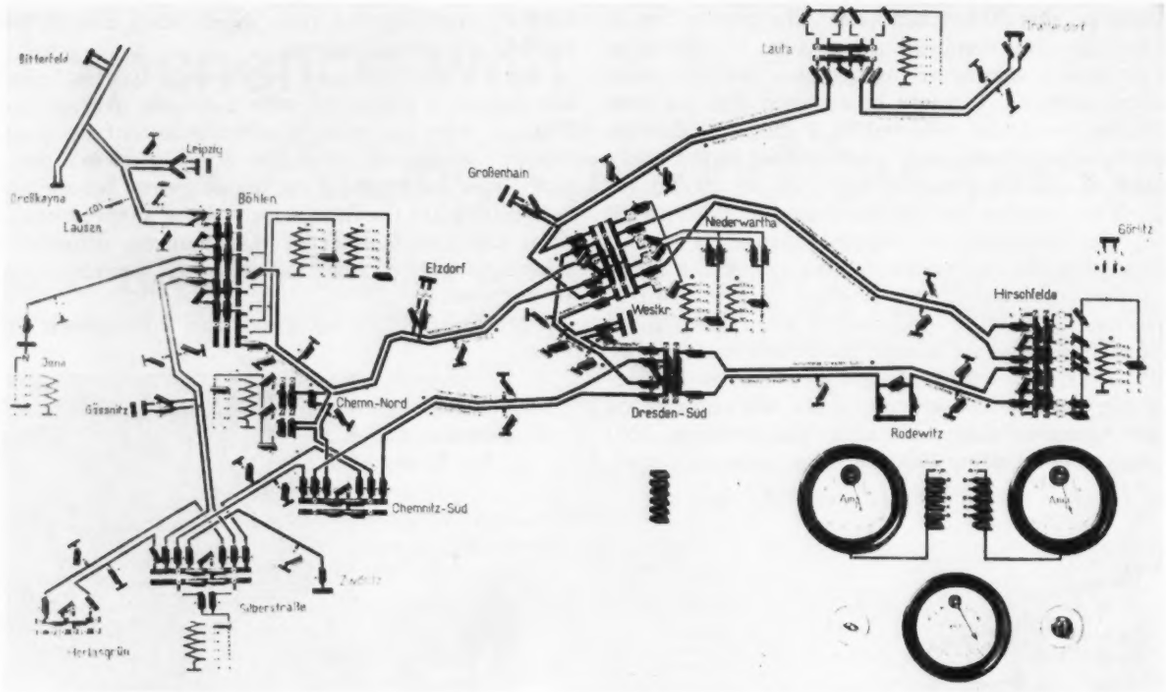


Petersen coil for 100 kv.



Gage panel for determining compensation

Each section of the line is represented by a wooden block, of a size proportional to the current that will flow if a phase is grounded. The blocks on the panel at any time correspond to the lines then in operation. The summation, read on the scale, shows the current that would flow in consequence of a ground and therefore the tap to be used on the compensating device.



Electrical supervisory panel for compensation used on 100-kv. network

For each line and for each coil-tap switched in, a corresponding plug is inserted on the panel, which is laid out schematically. The plug connects an appropriate resistance in parallel into the measuring circuit on the panel. With constant potential on the latter the indicator currents are therefore proportional to the line-to-ground and to the compensating current, respectively. These currents are read on the two ammeters. When changes are made in the lines corresponding changes are made on the coil-taps to keep the two readings substantially equal

are the "direct" ones where the primary cause—for instance, insulators, damaged by lightning—was on the disturbed section itself. In the statistics of the A.S.W. these disturbances are distinguished from the "indirect," which arise as a secondary effect of direct disturbances and cause an interruption of service. This includes, for instance, damage due to overvoltage in a station resulting from an arcing ground on a line. The ratio, indirect disturbances to direct disturbances, provides an index of the average number of secondary disturbances consequent upon each primary disturbance. This index has also fallen by 40 per cent.

It thus appears that the introduction of the arcing-ground suppressors has not only been followed by a decrease in the number of direct disurbances but that each of these has on the average resulted in a much smaller number of secondary disturbances. In this statistical trend we see that the improvements made from time to time in the A.S.W. network have had a remarkable and numerically demonstrable success. A large part of this improvement is ascribed to the introduction of arcing-ground suppressors.

Testimony of graphic instruments

As has been stated, a ground on a network with insulated neutral and arc suppressors does not necessarily imply an interruption. Nevertheless, it is interesting, on the basis of the experience of the A.S.W., to consider what would have occurred in a network with solidly grounded neutral, where every ground would have resulted in the automatic interruption of the circuit.

By using graphic instruments in the secondary of each arc-suppressing device every ground was recorded. It developed that only 11 per cent of all grounds on the 30-kv. network led to short circuits which had to be opened.

Therefore it is to be concluded that the vast majority of all disturbances in an overhead network begin with a ground. This is to be expected, since the chief cause of disturbances, namely, overvoltages of atmospheric origin, is first of all a stress on the insulation to earth. The cases leading to a short circuit would in the main be those comprising the simultaneous flashover of several phases, due to lightning. The figures quoted indicate how much more frequently the lines would have been cut off with a solidly grounded neutral.

No relay system is known to us that would cut off the grounded section of a ring network in every instance, with absolute certainty. Although relays have been installed, they are used only for signaling and not for disconnecting. The practice is to cut out the affected section by hand after telephonic communication with the neighboring station.

High-voltage lines protected

In view of this satisfactory experience, it was decided to equip the primary 100 kv. net with suppressors also. On the present circuit length of 1,300 km. the current to ground is about 350 amp. Most of the transformers have a neutral terminal. In the stations, as rebuilt, the installation of suppressor transformers would have been awkward, hence Petersen coils were used exclusively.

Provision for compensating up to 500 amp. was distributed among seven coils in five stations, four of them for 50 amp. and three for 100 amp. each. Each coil has five taps between 50 and 100 per cent of rated current. They are designed for two hours of operation in case of a ground. Experience with the lower voltage network showed that this would be adequate. All are of the outdoor type. Each station has a neutral bus whereby the

coil can be connected to any transformer. Like the other, the high-voltage net also is equipped with relays actuated by the current to ground, which again are used only for signaling. For supervising the amount of compensation the same panel and block scheme was provided as for the intermediate-voltage net. Very recently a more convenient arrangement has been set up in the station having control over this compensation. The requisite compensation is determined electrically. The illustration shows the method.

The necessary instructions are given by the dispatching station to the individual station by telephone.

As to operating experience on the 100-kv. network, the following statements may be made:

During more than three years of service there has not been a single disturbance at a neutral bus, at a coil nor at a transformer neutral, with one exception; this one case was due to a faulty contact in the switch mechanism for the taps.

The usefulness of the arcing-ground suppressors can also be shown by statistical evidence. Referred to the same length of system, the number of direct disturbances has averaged about 20 per cent less than before their installation. Here again the success of the arrangement becomes more evident if measured by the index previously described; its average decrease since the installation of the Petersen coils has been about 70 per cent. Moreover, from the showing made by the recording instruments it develops that only 25 per cent of all the grounds that have occurred have led to actual disturbances. This number happens to coincide exactly with that found by Dr. A. Menge† on the Bayernwerk network.

Intentionally grounded for tests

Before finally putting the suppressor equipment into operation, either in the 30- or in the 100-kv. network, comprehensive experiments were made by deliberately causing grounds at a great variety of places. By means of graphic instruments it was proved that the conditions specified in the contracts with the manufacturers were fulfilled. This excellent result of the tests has been confirmed by experience in operation. While there is a residual current which cannot be compensated, and which consists of a power current and of currents of higher frequency, it was invariably small—ranging between 5 and 10 per cent of the current to ground, depending on the degree of tuning. It was so small that the arc could be extinguished without trouble. Further, it was shown that detuning up to ± 10 per cent, which may be expected in operation when a section of line or a suppressor happens to go out is without appreciable effect on the performance.

Statistically, the demonstrable advantages of installing arcing-ground suppressors can hence be summarized thus:

1. Because the arc is promptly extinguished a great many grounds do not reach the point of appearing as disturbances, since there is no injury to material that permits another phase to be affected and that could therefore result in a short circuit.
2. The number of secondary disturbances formerly resulting from intermittent grounds has radically decreased.

Statistical evidence shows that most disturbances arise in aerial lines; of these, in turn, the vast majority are caused by thunderstorms. Since it is doubtful if the number of these direct disturbances can ever be reduced below a certain minimum, by economically feasible methods, the system of the A.S.W. is intentionally operated in a solid mesh. Wherever possible, every station is fed from two sides and on the most important ones double circuits are used.

So long as every disturbance is limited to the immediate point of failure, the best possible provision has been made for uninterrupted service. It is here assumed that every short circuit is disconnected in the shortest time by a suitable relay system without reference to other sections of the system and that the much more frequent grounds produce neither secondary disturbances nor destruction of material. For the attainment of this object the suppressing of arcing grounds has been found to be an indispensable factor.

†*"German Experience With Arcing-Ground Suppressors," "Electrical World," February 20, 1932.*

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Copper Plating of Steel in Cyanide-Free Bath

A new method of copper plating steel which avoids the serious objections of using cyanide solutions and gives a satisfactory copper deposit in 60 seconds with a current density of 10 amp. per square foot was reported recently before the Electrochemical Society by Colin G. Fink and Chaak Y. Wong. The major drawbacks of cyanide solutions are (1) the extremely poisonous nature of the cyanide and hydrocyanic acid formed by hydrolysis or action of acids and acid salts and (2) the instability of the cyanide bath.

In seeking a new method the difficulty of securing a firmly adherent deposit of copper on a more electronegative metal had to be overcome. In the case of steel a high current density was not sufficient to offset the potential difference. As an alternative the "effective" copper ion concentration was reduced by using a complex copper salt—$Na_2\ [Cu(C_2O_4)_2(H_2O)_2]$. To improve the conductivity of the bath Na_2SO_4 was employed. Boric acid was also a necessary constituent, used to regulate the pH value of the solution. These components were used in the following proportions: 2.7, 2 and 2.7 oz. per gallon. The copper salt used was found to be the most stable, most readily prepared and least costly of three complex salts chosen for experiments.

Tests at two current densities (10 amp. and 30 amp. per square foot) with the new bath (oxalato) and also with a cyanide solution showed that it takes less time to deposit a sufficient thickness of copper in the oxalato bath than in the cyanide bath with the lower density. The reverse was true with the higher density. Furthermore, the amount of copper deposited is not proportional to the time of plating in the oxalato bath, but tends to approach a maximum weight. High current densities and prolonged periods of plating promote the formation of black copper deposits, particularly around the edges of the plate. Consequently a current density of 10 amp. per square foot and a plating period of 60 seconds was considered to be most satisfactory.

The precipitation of a basic salt is not yet completely eliminated, but the slight deposit does not interfere with the operation of the bath. A good adherent copper deposit is obtained, forming a satisfactory basis for the acid copper bath to follow.

READERS' FORUM

Metric Dimensions Were Misleading

To the Editor of the ELECTRICAL WORLD:

Referring to the article "Air-Arc Power Rectifier for 150 Kv.," on page 491 of the April 15, 1933, issue of ELECTRICAL WORLD, I should like to call attention to one point where, in my opinion, the article does not seem to agree fully with the original appearing in the *Elektrotechnische Zeitschrift* of August 4, 1932. In the seventh paragraph of your article it is stated that the dimension D is 35 cm. and d is 10 cm.

I believe that these dimensions should be 35 mm. and 10 mm., respectively, as in Fig. 2 in the article the centimeters are believed to refer to the spacing between electrodes only.

You will note that in Fig. 3 the over-all dimension of an electrode is 15 cm. and that the arcing tip (similar to that indicated in Fig. 2) is only a part of the assembled electrode.

Philadelphia, Pa. **O. B. VIKOREN.**

[The dimensions were taken from an insert diagram on a chart in the original *ETZ* article. One of the scales of that chart gives the electrode spacing in centimeters. The units in the insert were assumed to be the same as those of the chart. Mr. Vikoren's reasoning shows that the dimensions were, in fact, in millimeters, though no indication to that effect appears on the diagram.—ED.]

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BOOK REVIEWS

Code for Protection Against Lightning

U. S. Bureau of Standards. Handbook No. 17. Published by Superintendent of Documents, Washington, D. C. 93 pages. Price, 15 cents.

Sponsored by A.I.E.E. and Bureau of Standards, this booklet has a 40-page appendix and bibliography on the origin, characteristics and magnitudes of lightning. The body of the code is devoted to protective measures for persons, buildings, ships, livestock, oil tanks, etc.

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The "Electrician" Annual Tables of Electricity Undertakings, 1933

Published by Benn Brothers, Ltd., 154 Fleet Street, London, E. C., 4, 262 pages. Price, 10 shillings net.

Now in its 46th eddition, this excellent work continues unrivaled as a reference book on electric service throughout the world. The large size gives each page an unusual amount of type area. The data include population of community served, plant installations, transmission, distribution and consumers' voltages, frequency, prices per kilowatt-hour and various other items. The major portion of the book is properly devoted to British undertakings, 170 pages. Dominion and Colonial undertakings follow, 46 pages. The rest goes to foreign undertakings.

One inexcusable blemish must again be mentioned. The data on service of the United States call for a thoroughgoing revision. Space is limited; selection is necessary. Under the circumstances the omission of places like Baltimore, Boston, Buffalo, Detroit, New Orleans, San Francisco and Washington, while Ashland, Far Rochaway, Great Falls and Holtwood are mentioned, is inexcusable. The fault can hardly be ascribed to lack of co-operation, in view of the general readiness of companies in this country to contribute information to reference works of recognized standing. Some one familiar with North American geography ought to take this part of the book in hand and bring its quality up to the level of the remainder.

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Electricity and Magnetism

By Norman E. Gilbert. Published by the Macmillan Company, 60 Fifth Avenue, New York. 533 pages, illustrated. Price, $4.50.

Evidently written to give the calculus-fortified college student of the physics side of electricity and magnetism a glimpse of electrical applications, this book perpetuates a past era of pedagogy. Interjected descriptions of electrical devices and systems are vapid, unbalanced and occasionally faulty. The author revives the old confusion about "per cent voltage regulation," says little about lightning magnitudes or the state of the dielectric art, thinks the induction watt-hour meter is an a.c. replica of the commutator type and, in talking of power costs, includes the demand charge twice in a new rate terminology.

It is to be feared that the physics student will get a jumbled and sketchy taste of the romance of working electricity superimposed on what is otherwise an acceptable conception of the physics background. As is the habit with the physics professor, the energy foundation of the universe is given due prominence, but the emphasis on energy in the fruition of all science—the world of industrial reality—is deplorably weak. It seems hard for electricity teachers to shelve their allegiance to the ballistic and tangent galvanometers of the Maxwell era.

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Standard Yearbook, 1933

Published by U. S. Department of Commerce, Bureau of Standards, Washington. 255 pages.

Details the accomplishments and agenda of all federal bureaus, international agencies, foreign national laboratories, domestic trade associations and professional societies engaged in scientific and commercial standardization, along with an outline of their procedures and methods of policing the standards promulgated.

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Short-Wave Wireless Communication

By A. W. Ladner and C. R. Stoner. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York. 348 pages, illustrated. Price, $3.50.

This is a practical textbook on the theory and practice of short-wave wireless communication. A history of the development is followed by technical chapters on fundamentals of wave propagation and the remainder of the book deals with technical and practical aspects such as transmitters, oscillators, aerials, receivers, modulators, feeders and commercial circuits and installations. While fundamental in treatment, the text is not mathematical or extremely technical. This book should be very valuable as a text and as an aid to men interested in this aspect of communication.

Men of the Industry

Professor Scott to Leave Yale University

Prof. Charles F. Scott, for the past 22 years head of the department of electrical engineering at Yale University, will retire from active teaching this month. Nationally known as engineer and educator, Professor Scott has been prominently identified with the electrical industry for a number of years and has been the recipient of its highest honors. A member of the American Institute of Electrical Engineers since 1892, he was made president during the year 1902-03, having served previously as manager and vice-president and as a member of several of its committees. His advocacy of the erection of a building for headquarters of the national engineering societies led to the receipt of the gift from Mr. Carnegie which made possible the culmination of his ideas in the Engineering Societies Building. He was a member of the conference committee of the national societies of electrical, civil, mechanical and mining engineers which formulated plans for the Federated American Engineering Societies, now American Engineering Council, and has served this organization continuously as an Institute representative.

Four years ago the Edison Medal of the Institute was awarded to him for his contributions to the science and art of polyphase transmission of electrical energy. As president of the Society for the Promotion of Engineering Education (1921-23) he proposed a serious consideration of methods of improving the teaching of engineering. In addition, Professor Scott is a member of the Illuminating Engineering Society, the American Society of Mechanical Engineers and of other technical societies.

Before assuming his academic duties at Yale University, in 1911, Professor Scott spent 23 years with the Westinghouse Electric & Manufacturing Company and has since served as consulting engineer for that organization.

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James W. Carey, of the engineering firm of Carey & Harlan of Portland and Seattle, has been appointed chief engineer of the Washington Department of Public Works.

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Robert M. Eames, general manager of the Bryant Electric Company, Bridgeport, Conn., has been elected vice-president of that organization. Mr. Eames became identified with the company in 1906. He organized the export department and was export manager from 1914 to 1921, when he was appointed general sales manager. He was selected for the general managership in 1930.

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A. E. Morgan to Direct Tennessee Valley Project

Arthur E. Morgan, who was appointed by President Roosevelt to be chairman of the Tennessee Valley Power Authority (Electrical World, May 27, page 659), has been a national figure in flood-control work for a number of years. At the present time he is president of Antioch College and president and a director of the Dayton Morgan Engineering

Company, conducting a practice in water-control engineering, reclamation of wet lands and flood control. A native of Cincinnati, Mr. Morgan spent his early life in the Minnesota prairie country and with his father engaged in a small surveying and engineering practice. After experimenting with drainage legislation, he wrote Minnesota's drainage code as early as 1905. In 1907 he became a supervising engineer in government drainage investigations, serving in North Carolina, Mississippi, Louisiana and Arkansas.

Later, as a private engineer in Memphis, Tenn., and Dayton, Ohio, he wrote reclamation codes for Arkansas and Mississippi and conceived the legal code known as the Ohio conservancy law. This work in Ohio was undertaken after the Ohio floods of 1913 had taken hundreds of lives and destroyed property valued in the millions. Under the Ohio conservancy law Mr. Morgan helped form the Miami River Conservancy District, and as engineer of both design and construction built the works that now protect Dayton and other Ohio cities from floods. In 1920 he was engaged to do similar work for Pueblo, Colo. Antioch College, of which Mr. Morgan is now president, has commanded much of his time since he became a trustee of that institution in 1919. In addition to performing his engineering and academic duties he has written extensively for the press on educational and technical subjects. Mr. Morgan is a member of the American Society of Civil Engineers, the Society for the Promotion of Engineering Education and other associations.

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Newton D. Baker has been elected a director of the Radio Corporation of America to fill the vacancy created by the resignation of Owen D. Young. Mr. Baker, who was Secretary of War in the Wilson cabinet, is a partner in the law firm of Baker, Hostetler, Sidlo & Patterson of Cleveland.

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Dr. John Johnston, who was elected president of the Electrochemical Society (Electrical World, May 20, page 633) at the recent convention in Montreal, has been director of research for the United States Steel Corporation at its Kearny, N. J., laboratory since 1927. Dr. Johnston was formerly head of the department of chemistry at Yale University and consulting chemist for the Bell Telephone Laboratories.

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Ralph B. Feagin will retire from his executive positions in New York with the Electric Bond & Share Company and its associated companies to resume the practice of law in Houston, Tex., as an active member of Baker, Botts, Andrews & Wharton, effective June 1. Mr. Feagin is a native of East Texas and his connection with the Houston firm dates from his graduation from the law department of the University of Texas in 1914. He resigned in 1927 to become a vice-president of Electric Bond & Share in New York. He was active in the organization of the United Gas Corporation and its principal operating subsidiary, the United Gas Public Service Company. He was president of the corporation from the time of its organization and will continue as counsel for the operating subsidiary.

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Guilliam H. Clamer, who has been associated with the advancement of metal casting for approximately 40 years, has been awarded the Joseph S. Seaman gold medal by the American Foundrymen's Association for outstanding achievements in that field. Under his executive direction many valuable improvements in melting and casting practices have been developed. Following graduation from the University of

Pennsylvania in 1897 Mr. Clamer established a chemical laboratory at the Ajax Metal Company, Philadelphia, with which he has since been associated. In addition, he is president and general manager of the Ajax Electric Furnace Corporation, Ajax Electrothermic Corporation and Ajax Electric Company, Inc. Constantly active in the affairs of technical societies allied with the foundry industry, he is a past-president of the American Foundrymen's Association, the American Institute of Metals, a member of the board of managers of the Franklin Institute, charter member of the American Electrochemical Society and a member of the American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, the American Society for Steel Treating and of other technical associations. Next week the honorary degree of doctor of science will be conferred upon Mr. Clamer by Ursinus College, Collegeville, Pa., because of his position and achievements in the scientific field.

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FREDERICK E. MURPHY, owner and publisher of the Minneapolis *Tribune*, has been elected president of the Manistique (Mich.) Light & Power Company.

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OBITUARY

THOMAS C. FALES, president of T. C. Fales & Company, investment bankers, Boston, Mass., and during a long period of time prominently identified with the public utility industry in that state, died May 21 at his home in Cambridge. For many years he headed the Attleboro Steam & Electric Company, the Dedham and Hyde Park Gas & Electric Company, and the West Boston Gas Company and had extensive financial interests in other ventures.

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CLARENCE E. DOOLITTLE, consulting hydro-electric engineer, died at his home in Glendale, Calif., April 29, in his seventieth year. He had relinquished his active practice in 1923 because of ill health. A graduate of Cornell University, Mr. Doolittle became associated with the Brush Electric Company, Cleveland, and after a short connection with that organization was appointed electrical engineer for the Aspen Electric Company, Aspen, Colo. When this company consolidated with the Consumers Electric Light & Power Company, in 1887, he became electrical engineer, and subsequently vice-president and general manager. In 1905 he severed his affiliation with the company to transfer his interests to Chile, where he installed the hydraulic works for the first mill built by the Braden Copper Company, now part of the Kennecott holdings. He returned to Aspen and again pioneered in the use of electric power for pumping in mines. Mr. Doolittle was a fellow of the American Institute of Electrical Engineers.

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CHARLES E. HARPHAN, for 45 years a designing engineer for the General Electric Company and the contributor of many improvements in its street lighting equipment designs, died at Lynn, Mass., May 26 at the age of 69. He retired about three years ago.

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HARRY H. CUTLER, inventor and founder of the Cutler-Hammer Company, manufacturer of electric controlling devices, died at his home in Miami, Fla., May 20, at the age of 73. Mr. Cutler, who was identified with the electrical control and gas engine industry during his entire life, founded the company in 1893 in Chicago and later the company was reorganized in Milwaukee. He was an official of the organization until 1917, when he sold his interest and retired. He had more than 90 patents in electrical control equipment.

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CLEMENCE W. HIPPARD, research engineer for the Union Electric Light & Power Company of St. Louis, Mo., died of pneumonia, in Belleville, Ill., May 18. He was 40 years of age. Mr. Hippard was a graduate of the Missouri School of Mines and of the School of Engineering of the University of Illinois.

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New Equipment Available

Pole-Type Distribution Transformers

Pole-type distribution transformers in sizes up to 100 kva. and for voltages of 8,650 Y or less have been announced by the American Transformer Company, Newark, N. J. These units, designated type RS transformers, have a number of new features. The coils are vacuum impregnated in varnish having about 70 per cent solids, thus providing an insulating medium which is superior to many usual compounds. Coordinated low-flashover bushings may be replaced easily and quickly, no soldering, yet they are incapable of syphoning oil, are splash-proof and weatherproof. Transformers are shipped filled with oil, proper cover and pocket gaskets making this possible by preventing leakage.

The weight of the transformers has been materially reduced and the heat-radiating area retained by a tank of unique construction; cruciform in cross-section, it approximates the shape of the core and coils. Proper cooling and high overload capacity are assured by adequate ventilation through well-distributed oil ducts.

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ALL-RUBBER LAMP CORD, carrying luster lacquer finish in old gold, bronze, silver and green colors, is announced by the Belden Manufacturing Company, Chicago, Ill. "Luster Cord," as it is called, is furnished on spools or in lengths equipped with unbreakable Belden soft rubber plugs, tinted to match the cord.

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ROTARY AIR COMPRESSORS and vacuum pumps of the multi-cellular, sliding-vane type, in both water-cooled and air-cooled designs, have been announced by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis. The line covers a range of volumes from 50 to 2,000 c.f.m. at pressures up to 150 lb. and vacuums up to 29.85-in. mercury. The air-cooled units are suitable for pressures up to 10-lb. G. and vacuums up to 18-in. Hg, and the water-cooled units for higher pressures and vacuums.

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A FORWARD STEP in fuse plug design has been made by the Royal Electric Company Inc., Avon, Mass., known as the "Tell-Tale Disk," an improvement in design that increases materially the degree of visibility of the fuse link. The disk, in bright color, is placed in the fuse behind the fuse wire and shows up the wire in such bold relief there is not the slightest possibility of mistaking whether or not a fuse is blown.

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UPRIGHT JOINT CLOTH for wiping joints on vertical splices on lead-sheathed cable has been announced by G. E. Williams, manufacturer, Minneapolis, Minn. The wiping surface is treated with a specially prepared dressing that protects the cloth from the heat and prevents the half-melted solder from sticking to the surface.

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PORTABLE A.C. TESTING KITS consisting of a 2½-in. dial, 110 deg. moving iron ammeter and voltmeter have been announced by Ferranti, Ltd., England. The voltmeter has six ranges, 0-7.5, 15 and 30 volts, 10 ohms per volt, and 0-150, 300 and 600 volts, 100 ohms per volt, and is designed to run continuously up to 300 volts. The ammeter has two ranges, 0-0.5 and 0-5 amp. The instruments employed are of the repulsion type, having irons of nickel iron alloy so treated that the errors due to iron loss, hysteresis, etc., are negligible.